Connecticut Department of Environmental Protection

Nonpoint Source 319 Program Quality Assurance Program Plan (QAPgP)

EPA RFA #06152

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AUTHORITY

Section 319 (§319) of the federal Clean Water Act (§319) establishes a national program to control nonpoint sources (NPS) of water pollution. The U.S. Environmental Protection Agency (EPA) defines NPS pollution as that which is "caused by diffuse sources that are not regulated as point sources and are normally associated with precipitation and runoff from the land or percolation." To help address NPS pollution, §319(h) authorizes the EPA to award grants to states and tribes with EPA-approved NPS management programs.

In Connecticut the §319 program is administered by the Connecticut Department of Environmental Protection's (CT DEP) Bureau of Water Management (BWM). CT DEP coordinates the state's NPS program in cooperation with other federal, state, regional, and municipal government agencies and organizations under a wide range of statutory and regulatory authorities relevant to NPS control. EPA approved Connecticut's NPS Management Program in November 1999 (see Nonpoint Source Management Program at http://www.dep.state.ct.us/wtr/nps/npsmgtpl.pdf).

Under the §319 Program, CT DEP awards a portion of the annual grant to implement NPS management activities throughout the state. Each year the CT DEP issues a Request for Proposals (RFP) for projects to be funded through a competitive process. Proposals may be submitted by any interested Connecticut public or private organization. (see FY2006 Request for Proposals for the Nonpoint Source Management Grant Program Funded under § 319 (h) of the Federal Clean Water Act http://www.dep.state.ct.us/wtr/nps/proposalrequest.htm)

This Quality Assurance Program Plan (QAPgP) focuses on these granting activities rather than other programmatic activities within the BWM funded by §319 under the Performance Partnership Agreement (PPA).

TITLE AND APPROVAL PAGE:

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§ 319 Nonpoint Source Program Quality Assurance Program Plan

EPA RFA #06152

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INTRODUCTION

The purpose of this document is to define the process used by the Connecticut Department of Environmental Protection (CTDEP) Section 319 (§319) Nonpoint Source (NPS) Grant Program to assure project and programmatic technical and administrative quality. A Quality Assurance Program Plan (QAPgP) defines and justifies an overall quality assurance strategy and methodology to ensure credibility of the ongoing program, and provides measurable results for projects approved for funding under the NPS Grant Program. CTDEP's QAPgP, therefore, provides consistency with both EPA guidance and CTDEP's *Quality Management Plan* (CTDEP, 2002), for which a common goal of establishing and maintaining consistent and appropriate programmatic quality assurance for all technical and implementation activities. As a broader, programmatic plan, it does not provide the level of detail required for monitoring, modeling, or specific data collection and manipulation activities that will still require project-specific Quality Assurance Project Plans (QAPP).

This QAPgP will be reviewed and updated by the CT DEP, as warranted by programmatic revisions, but at least on a five-year basis. Modifications prior to a five-year renewal will generally be accommodated by amendment or through the addition of appendices. CTDEP will notify EPA of these modifications and provide copies of updated information for review and approval.

PROGRAM GOAL

Connecticut's policy, articulated in the Connecticut General Statutes (CGS) Sec. 22a-1, is:

> To conserve, improve and protect its natural resources and environment and to control air, land and water pollution in order to enhance the health, safety and welfare of the people of the state.

Further,

> To improve and coordinate the environmental plans, functions, powers and programs of the state, in cooperation with the federal government, regions, local governments, other public and private organizations and concerned individuals, and to manage the basic resources of air, land and water to the end that the state may fulfill its responsibility as trustee of the environment for the present and future generations.

This policy sets the stage for the broad authorities the Commissioner of CTDEP enjoys to protect the environment and do it consistently with the interests of all levels of government and full public involvement. Specifically (CGS Sec. 22a-424(b)), "To

develop comprehensive programs for the prevention, control and abatement of new or existing pollution of the waters of the state."

Within this statutory framework, the goal of the CTDEP NPS Grant Program is to protect and restore or improve the quality of waters impacted by nonpoint sources of pollution. To this end, CTDEP judiciously uses §319 funds, in addition to other funds, to support a variety of projects to assure state policies and federal requirements are met. In particular, NPS implementation projects using best management practices (BMP) are essential to achieve this goal.

Connecticut's NPS Management Program networks amongst many programs administered by partner federal, state, and municipal government agencies and organizations. CTDEP is designated by the Environmental Protection Agency (EPA) as the primary state nonpoint source management authority, and its Bureau of Water Management (BWM), Planning and Standards Division (PSD) works with a large number of programs relevant to NPS management, including the state's §319 Grant Program. Collectively, CTDEP and its partner agencies and organizations have collaborated to establish goals and objectives that effectively implement NPS pollution management in Connecticut. The NPS Grant Program is a prime example of this collaboration, and the structure and administration of the Grant Program has adjusted and matured to ensure quality assurance practices are incorporated into all aspects of the program.

PROGRAM QUALITY OBJECTIVES

To ensure NPS Grant Program progress, effectiveness and quality, CTDEP has developed programmatic protocols for administration and project (grantee) activity and tracking progress of the grants. Further, CTDEP reports on progress and pollutant load reductions for all grants according to EPA protocols under the Grants Reporting and Tracking System (GRTS). This QAPgP reviews general administrative protocols used for the Grant Program and also specifies several project categories among which program technical quality objectives may vary depending on project category. For implementation projects, for example, CTDEP ensures that BMPs are selected, installed, and used properly, and result in efficient and effective pollution control. Pollutant load reductions (i.e., nutrients and sediment) are estimated using simple models developed for, and recommended by, EPA. These estimates are deemed suitable for §319 Program needs by EPA and allow both the states and EPA to track pollutant reduction trends on a national basis using a consistent framework. To meet tracking needs, all grantees must fill out a GRTS reporting form that provides the supporting data necessary for both model estimates and project tracking. (*See* CTDEP's form for EPA's Mandate elements for GRTS (http://www.dep.state.ct.us/wtr/nps/grts.doc)). Therefore, the objectives of this QAPgP are to ensure:

- Implementation projects selected under the NPS Grant Program are appropriate and effective
- Projects are properly implemented in a timely and cost-effective manner

- Projects are located in priority areas appropriate to the implementation activity
- Reasonably accurate pollutant load reduction estimates for nutrients and sediments are generated for each project
- Grantees provide necessary information to track project implementation and estimate pollutant load reductions
- Procedures are in place to review progress and make appropriate adjustments to projects during the implementation period
- Project implementation is in accordance with EPA QA requirements and consistent with CT DEP's Quality Management Plan (August, 2002)
- Final deliverables and outcomes meet work plan commitments

PROGRAM DESIGN

CTDEP's NPS Program is designed to accommodate good quality assurance measures and review that meet the objectives listed above. These might be categorized in three activity areas for discussion, although the actual process from selection through close out is less discrete as NPS staff continuously work and communicate with grantees to help ensure success of their projects. This interaction is fundamental to sound quality assurance principles of review and timely corrective actions when problems arise. However, the annual granting process does correlate to 1) a review and selection activity; 2) an implementation activity, and 3) a reporting activity that includes responding to GRTS guidelines.

Project Review and Selection

Each year, around spring, (depending on the timing of the finalization of the EPA budget) CTDEP releases a Request for Proposals (RFP), posted on the DEP web and also by hard copy upon request. The RFP generally seeks projects for the prevention, control and/or abatement of nonpoint source pollution, but specific focus areas and requirements of the Sec. 319 guidance are incorporated into the RFP as well (*See* FY 2006 RFP – Attachment I). The RFP advises applicants of the availability of Grant Program funds under § 319, which vary annually, for eligible projects that support the implementation of the Connecticut's NPS Management Program. The RFP provides specific instructions on how to apply, a schedule for that year's grant process, and priority areas for funding. In recent years, CTDEP has encouraged applicants to consider EPA-mandated development of watershed-based plans (WBP) and implementation activities related to Sec. 303(d) listed waterbodies where NPS-caused impairments were believed to exist. A specific application form (Attachment II for FY06) is provided to help ensure proposals are complete and address CTDEP evaluation and reporting needs. Applicants are advised to consider quality assurance effort and costs in their proposals, where applicable, and a link to EPA's Quality Assurance web site is provided.

Sec. 319 funds are limited; therefore, this is a competitive bid process to ensure that the most appropriate and technically feasible projects are selected for funding at a reasonable

cost. Proposals may be submitted by any interested Connecticut public or private organization, *i.e.*, municipalities, nonprofit environmental organizations, regional water authorities/planning agencies, and watershed associations. Applicants are encouraged to partner with other public agencies, *e.g.*, regional planning agencies may partner with member municipalities. All proposals submitted for these funds must identify a 40% non-federal cash or in-kind services match. The review process incorporates expert review from within and outside of CTDEP using a formal, standing NPS review committee. A typical schedule for awarding §319 funding.

Month	Activity
April	CTDEP releases request for proposals (RFPs)
August	Proposals due to CTDEP
September – December	CTDEP NPS review committee reviews, ranks, and selects potential projects
February	EPA provides final funding allocation to CTDEP
March	CTDEP sends out letters announcing which projects are selected for potential funding, with suggested changes for full project work plans and recommended funding levels
April	Project proponents submit final project work plans.
April - May	CTDEP compiles project work plans into a single grant application. CTDEP submits grant application and program work plan to EPA.
May-June	EPA approves §319 grant application and CT DEP prepares contracts/memo of understanding with project proponents
August	Proposals submitted in response to the RFP must be postmarked or received electronically by date certain. Proposals postmarked or received electronically after that date will not be considered for funding that fiscal year.

Specific proposal selection criteria are used in determining which proposals are most likely to meet the objectives of the NPS Grant Program:

- Addresses one or more of the stated NPS program priorities for FY2006 and beyond;
- Develops or implements a watershed-based or NPS TMDL implementation plan;
- Demonstrates a clear understanding of the nature, extent, and severity of the NPS problem;
- Has a high probability of success;
- Describes projected benefits quantitatively (with an emphasis on measurable results);
- Documents local support and participation (e.g., local funding or letters of support);
- Involves interagency coordination (document cooperative agreement);
- Is cost-effective;

- Can be initiated within one year of contract/agreement approval, and completed ideally within 2-3 years of contract/agreement approval;
- Leverages other funding sources;
- Demonstrates innovative practices and/or technologies;
- Provides results that contribute to the statewide control of NPS; and
- Completeness of proposal form.

The NPS Review Committee in their evaluations and ranking of proposals and in their deliberations uses these criteria during the final selection process. This review constitutes an important step in the quality assurance review to ascertain the relevance, viability, effectiveness, and cost-effectiveness of the project, as well as compliance with administrative needs. The NPS Review Committee generally comprises, but is not limited to, CT DEP staff (including staff from Planning and Standards Division (PSD); Permits and Enforcement Division (PED); Inland Water Resources Division (IWRD); Office of Long Island Sound Programs (OLISP); USDA Natural Resources Conservation Service, CT Council on Soil and Water, and the EPA Region I nonpoint source coordinator for Connecticut.

NPS Review Committee members rank proposals based on the RFP evaluation criteria. This information is compiled by the NPS Coordinator and used to select the top ranked projects for funding. A committee meeting is held for final discussion and selection of projects. At that meeting, the EPA NPS coordinator or any committee member may raise any considerations related to §319 eligibility and compliance with the §319 national guidelines. Projects determined to be non-eligible may be removed from further consideration; some projects may be selected but require modifications agreed upon by the committee.

Once the committee agrees on the group of projects to be funded, the CTDEP NPS coordinator will present the selected proposals to the BWM PSD director, and subsequently to the CTDEP Commissioner for approval. Once approval is obtained from the CTDEP Commissioner, the CTDEP NPS coordinator notifies recipients of the decision and explains any modifications or enhancements needed to the project workplan, based on the Review Committee's recommendations. The recipient makes the needed changes and submits a workplan to CTDEP. The CTDEP NPS coordinator will review the workplans and may require additional revisions or refinements. The final workplan for each project is then submitted to EPA for review and approval. Once the workplan is approved, the CTDEP NPS coordinator will work with grantees to draft agreements that will become final, legally binding contracts with CTDEP. That agreement must be in place before any project activity can begin.

Project Implementation

Once CTDEP has a binding agreement with a grantee, and a defined workplan with specific tasks, outcomes and deliverables, the project moves into an implementation period. The CTDEP NPS Program has recently drafted administrative guidelines that detail both grantee and DEP responsibilities, project deliverables, procurement, problem

resolution, change in work, GRTS requirements, QAPP (if warranted), invoice and payments, non-federal match, site reporting, and progress reporting (Attachment III: Draft Administrative Guidelines, Nonpoint Source Grant, September 2005).

The work plan requires several elements, many critical to sound management principles and good quality assurance protocols as well as facilitation of reporting. The general outline of the workplan includes: title, summary, project location, project manager, watershed-based planning elements, construction schedule, long term maintenance plan, interagency coordination/roles/responsibilities, quality assurance/quality control, tasks/deliverable/estimated cost, public participation, budget and list and schedule of deliverables that meet grant requirements (Attachment II: 319 NPS Application and workplan Form).

The CTDEP NPS Coordinator also assigns appropriate DEP staff to provide technical oversight for projects, particularly those awarded to non-DEP entities. Often, state watershed coordinators fill this function, although staff from other DEP programs and offices may be recruited when specific expertise is needed. In particular, lakes, coastal, fisheries, and inland water resources staff are often involved in these projects. These staff keep constant communication with grantees to assure project implementation meets all Sec. 319 criteria, requisite permits are obtained, and projects meet acceptable performance levels, especially when BMPs are installed.

While EPA has reduced its reporting requirements to a biannual cycle, CTDEP may still require its grantees to submit quarterly progress reports if warranted to maintain strict quality control over NPS Program-funded activities. If a project falls behind, requires corrective action, or circumstances arise that prevent timely implementation, CTDEP can take appropriate action, which may involve postponement of additional funding or even reprogramming of funds in worst case situations. Reprogrammed funds are often directed to another project that is ready to go or that is already underway but could use some supplemental funding.

As discussed above, the grantee is required to submit quarterly and semi-annual progress reports plus a final report as part of their agreement. The final reports must include a clear description of the project, its execution, and measures of success. General format includes: executive summary; introduction; resource and environmental problem identification and assessment; solution to the problem (*i.e.,* generally the project activity); project partners and funding; results; future plans; and conclusions/recommendations on project's success/improvements. The CTDEP NPS coordinator incorporates the progress and final reports into semi-annual §319 reports to EPA.

Project Reporting

It is essential for grantees to document their activities by providing appropriate records and data management protocols that are used to both track NPS management progress in the state and to benefit future programs that can learn from predecessor experiences. These activities also meet EPA GRTS tracking requirements and can provide publications and materials such as success stories that can be shared throughout the

nation. Measures of success are also required by EPA to meet federal Office of Policy and Management (OPM) Performance Assessment Rating Tool (PART) requirements that demonstrate value of programmatic activities.

GRTS reporting requirements fall into two categories: administrative/fiscal reporting and technical (primarily pollutant load reduction) reporting. CTDEP has devised a form for grantees to use to provide most of the material required by GRTS (Attachment IV). The form covers all GRTS mandatory reporting information in the first part, and includes some basic data forms for the quantitative measures of pollutant load reductions of nitrogen, phosphorus and sediment. The load reduction information is used by CTDEP staff to calculate reductions from BMPs using the EPA Region 5 model (Attachment V). Pollutant reduction calculation protocols will be discussed in more detail below.

By keeping the projects, and their funds, separate under a categorical grant, the state NPS Program has been able to maintain an excellent project management system with a solid financial tracking. CTDEP tracks all 319 grants utilizing both Excel spread sheet/Access database as well as complete paper files for each project where reports and other deliverables are stored and available upon request to interested parties. The electronic files assist in the financial tracking of the 319 funds/quarterly and mid-year reporting. The hard copy files (at CTDEP offices, 79 Elm Street, Hartford, CT) for each project within a given fiscal year are in individual folders identified by project number. Each file contains award letters, original and/or revised workplans, agreements, invoices, approved Quality Assurance Project Plans (for projects involving chemical or benthic monitoring/streamwalks), deliverables (including final report), correspondence and final match documentation. CTDEP's financial management practices are consistent with standard approved accounting practices and with federal financial assistance guidelines, ensuring the effective and efficient use of all available resources. The state NPS Program also has been very effective in leveraging resources from other federal, state, and local government agencies and nonprofit organizations through its grant programs, which all require significant matching contributions.

The CTDEP requires grantees retain grant records for a period not less than three years following project completion to be used in the event of an audit. CTDEP is also required to retain grant records for at least three years after the federal grant closeout. The CTDEP nonpoint source coordinator maintains all project records filed by fiscal year. DEP provides EPA with workplans and agreements, approved QAPPs, mid-year reporting, final reports and match certification.

Pollutant Load Reduction Estimation

CTDEP has taken a practical approach to estimating pollutant load reductions required by GRTS for nitrogen, phosphorus and sediment. While monitoring is the ideal way to determine quantitative reductions in pollutant loads, the intensity required to statistically confirm a change in pollutant loads would be cost prohibitive. This is because reductions from individual BMPs are usually relatively small and variability in loads caused by natural conditions such as rainfall often masks the attained reductions. Under those

unavoidable conditions years of at least monthly sampling both before and after BMP implementation are generally required to provide an estimate that would be an improvement over literature values.

CTDEP's approach is to avoid these complications through a more simplistic approach that documents a relative change, supported by the literature, and minimizes cost. The EPA's Region 5 model (Attachment V) meets the need for providing reasonable estimates without unnecessary diversion of effort away from management activity in the field. The Region V model provides a consistent framework for estimating pollutant load reductions based on data from the literature. It also accommodates local character through a series of drop sheets that identify the locale and some basic characteristics of the site, such as soil type and site features relevant to the BMP. Although there are more complicated approaches and models, none provide any added assurance as to the accuracy of the pollutant load reductions.

Each year, CTDEP requires basic information from grantees on implementation activity in simple data sheets attached to the GRTS reporting form (Attachment IV). The information covers the all input data required to run the Region V model. Upon submission, DEP staff review the forms and compare the activity to the grantee work plan to be sure the activity is consistent with the proposal. Any inconsistencies are resolved with the grantee by phone. In some cases, when the grantee does not have knowledge about a particular parameter, default values are used (e.g., general soil character for the county if site conditions are not well-studied or default soil nutrient concentrations from the Region V model since such measurements are rarely taken on site). In most cases, specific BMP activity is matched to those provided in the Region V drop lists, but in cases where mixed BMPs are applied (e.g., for general site recommendations in developments, or comprehensive farm plans), a BMP that provides a general load reduction is applied to the acreage of the project site (e.g., "water quality inlets" for suburban development or "agricultural field practices" for farm management activity).

All data are recorded in a separate page of the Region V model spreadsheet for each fiscal year (Attachment VI, for example, constructed for the FY04 project analysis). That sheet summarizes the key information provided by the grantees plus details on how the Region V model was configured for each project. Current and cumulative load reductions for the three requisite pollutants calculated by the model are also stored in that spreadsheet, and ultimately entered into GRTS. The spreadsheet provides back up to the GRTS data should there be any data loss in the system or should any of the estimates need to be recalculated because of questions of accuracy or changes in work plans.

There are a few projects that include environmental monitoring in their work plan, and provide data generated from field monitoring activity. Monitoring projects involving the collection and analysis of water quality samples require a separate Quality Assurance Project Plan (QAPP) that includes the additional elements described in EPA Requirements for Quality Assurance Project Plans, EPA QA/R-5, March 2001. The

Jordan Cove National Monitoring project, for example, provides pollutant load reductions based on their monitoring activity (Attachment VI).

CT DEP NPS PROGRAM FOR CONTINUOUS IMPROVEMENT

As noted in the introduction, it is anticipated that this QAPgP may need periodic revision, and revisions (or reissuance if there are no changes) are planned at least every five years. CTDEP's NPS program is continually reevaluated and subject to changes in EPA guidance. It is important that the value, and the quality assurance mechanisms, of the program are keep current and are effective.

EPA approved Connecticut's NPS Management Program in November 1999 (see Nonpoint Source Management Program at http://www.dep.state.ct.us/wtr/nps/npsmgtpl.pdf). The Connecticut NPS Program periodically reviews and evaluates its program as required by EPA Sec. 319 guidance. This has generally been accomplished through development of "key element" analyses, Water Resource Assessments, WBPs, and other activities that affect day-to-day operating procedures. These are articulated in CTDEP water program strategies (e.g., Environmental Quality Strategic Plan, http://www.dep.state.ct.us/cmrsoffc/strategicplan/strategicplan02.pdf) and the biennial Performance Partnership Agreement between CT DEP and EPA, and measured as progress in meeting programmatic goals and objectives.

Evaluation mechanisms include: periodic reviews by the statewide advisory committees; quarterly, mid-year and annual reports; an annual § 319 work plan; "success stories" for EPA and CTDEP publication; and monitoring data for waters where nonpoint source implementation is occurring. CTDEP utilizes several standing committees to provide input and guidance on NPS Program goals, objectives, strategies, and activities. The CTDEP will continue to update the program and seek periodic reviews of this nature, focusing on the attainment of the long- and short-terms goals, objectives, and strategies.

In application of this QAPgP to the NPS Grant program, the CTDEP requires quarterly progress reports from §319 grant recipients, and meets periodically with project managers, through which progress is evaluated on a project-by-project basis. These reports are compiled, summarized, reviewed and submitted to EPA semi-annually. Data entry into GRTS provides an additional opportunity to ensure project completeness and accuracy. Each year the CT DEP issues an annual report summarizing program accomplishments over the previous calendar year, highlighting programmatic and environmental results.

CTDEP and EPA jointly review the §319 RFP and workplan format each year for any needed changes or improvements. This joint review allows an opportunity to modify the focus of pass-through projects, adjust priorities, and identify any new requirements. EPA also reviews and approves Connecticut's overall §319 workplan. This workplan summarizes how CT DEP plans to use and pass through its §319 funds for each fiscal year.

ATTACHMENTS

Attachment 1 - Section 319 Nonpoint Source Grant Requirements and General Information FY2006 see: http://www.dep.state.ct.us/wtr/nps/grantreq.htm

Attachment 2 - FY2006 Application - Work Plan see: http://www.dep.state.ct.us/wtr/nps/appform.doc

Attachment 3 - Administrative Guidelines, Nonpoint Source Grant, September 2005

Attachment 4 - CT DEP's Form for EPA's Mandate Elements for Grants Reporting and Tracking System (GRTS), 2005

Attachment 5 - Pollutant Controlled Calculation and Documentation for Section 319 Watersheds Training Manual, (Region 5 Load Reduction Model) Revised June 2003

Attachment 6 - Pollutant Load Reduction sheet for CT DEP 319 FY 04 Analysis

Attachment 1 Section 319 Nonpoint Source Grant Requirements and General Information FY2006 see: http://www.dep.state.ct.us/wtr/nps/grantreq.htm

Section 319 Nonpoint Source Grant Requirements and General Information - FY2006

Background

Section 319 of the federal Clean Water Act (§319) establishes a national program to control nonpoint sources (NPS) of water pollution. The U.S. Environmental Protection Agency (EPA) defines NPS pollution as that which is "caused by diffuse sources that are not regulated as point sources and are normally associated with precipitation and runoff from the land or percolation." To help address NPS pollution, §319(h) authorizes the EPA to award grants to states and tribes with EPA-approved NPS management programs. In Connecticut, the §319 program is administered by the Connecticut Department of Environmental Protection's (CT DEP) Bureau of Water Management. Each year the CT DEP issues a Request for Proposals (RFP) for projects to be funded through a competitive process under §319. Proposals may be submitted by any interested Connecticut public or private organization.

Authority

CT DEP coordinates the state's NPS program in cooperation with other federal, state, regional, and municipal government agencies and organizations under a wide range of statutory and regulatory authorities relevant to NPS control. CT DEP is authorized to administer the §319 grant program. EPA approved Connecticut's NPS Management Program in November 1999 (see *Nonpoint Source Management Program*).

Program Priorities for FY2006

Some major enhancements have been made in the FY06 grant program that focus on CT DEP's priorities and respond to changes in EPA guidance last published in 2003. There will be continued emphasis on funding implementation projects, particularly those that address a documented NPS-related water quality impairment identified on Connecticut's List of Impaired Waterbodies, also known as the "303(d)" list. Other allowable projects emphasized in EPA guidance include those that would develop implementation plans, Total Maximum Daily Load (TMDL) analyses, or §319-defined Watershed-Based Plans. While there are many water bodies that may meet these general qualifications, CT DEP has placed projects within the Thames River Basin at a high priority because of identified NPS impairments and the ongoing state and federal investment in resolving those impairments. DEP has also identified an additional subset of water bodies from the impaired waters list for which it is interested in funding watershed-based plans and restoration activities (Table 1). Therefore, implementation projects in the Thames River Basin and these additional water bodies will receive special consideration in the FY2006 grant process.

General Priorities for FY2006 funding:

1. Management of water bodies on Connecticut's 2004 §303(d) list of impaired waters, *Connecticut Waterbodies Not Meeting Water Quality Standards* (Impaired Waters List)(PDF, 818K). The document is a comprehensive listing of impaired surface waters located in Connecticut for which additional pollution controls or other management needs may be necessary to achieve Water Quality Standards. Special consideration will be given to projects in the Thames Basin, with emphasis on nutrient (nitrogen and phosphorus) and pathogen (bacteria) impairments, and the other water bodies specified in the list below.

2. Developing Watershed-Based Plans, especially in the Thames Basin and the water bodies specified below, but also for other water bodies listed on the Impaired Waters List. (See requirements for **Watershed-Based Plans** in EPA's Guidelines for States' Implementation of Nonpoint Source Management Programs under §319 of the Clean Water Act, covering FY2004 and after).

Required components of a watershed-based plan include:

a. Identify causes and sources of impairment
b. Estimate expected load reductions
c. Describe needed NPS management measures
d. Estimate needed technical and financial assistance
e. Public information and education
f. Implementation schedule for NPS management measures
g. Measurable milestones
h. Performance criteria
i. Monitoring plan

3. Projects to assist CT DEP with the development of TMDLs for water bodies listed on the Impaired Waters List. These projects are best identified and proposed with forethought and communication with CT DEP's TMDL staff to ensure utility in TMDL development (see below).

4. Other types of activities to combat NPS pollution, especially installation of best management practices, but also including relevant activities such as outreach, education, and training. To accommodate priority restoration activities, however, **funding dedicated to these projects will be at a lower level than in past years**. Ambient monitoring activities not linked to TMDL development or project implementation will be a lower priority for §319 funding this year.

Below is a list of water bodies (Table 1) for which DEP is giving special emphasis for 319 funding to develop watershed-based plans and for projects to restore water quality to standards. DEP may consider projects designed to plan for and implement fixes for any impairment on the 303d list, but unless they are on the short list, they will be a lower priority. Refer to the link to the complete 303d list. Water bodies impaired by

stormwater runoff are included where waterfowl and/or agriculture impairments exist. We also encourage proposals for funding to conduct activities **not** covered by the Municipal Separate Storm Sewer Systems (MS4) general permit (e.g., retrofits to existing stormwater collection systems, installation of infiltrator or settling structures in areas developed before adoption of the permit). See discussion of stormwater projects, below, for eligibility.

Table 1: List of priority water bodies for development of watershed-based plans and restoration activities that will result in or move towards the water bodies meeting water quality standards in a relatively short time.

Water body	Location	Probable Cause	Impairment	Potential Source
Eagleville Brook	Mansfield	Copper, sediments	Aquatic Life	Bank Destabilization, Land development, Landfills, Urban Runoff/Storm Sewers
Upper Shetucket River, segment 5	Windham	Bacteria	Contact Recreation	Source Unknown
Lower Natchaug River, segments 1-2	Willimantic	Bacteria	Contact Recreation	Source Unknown
Mashamoquet Brook	Pomfret	Bacteria	Contact Recreation	Agriculture, Source Unknown
Roseland Lake	Woodstock	Unknown	Contact Recreation	Source Unknown
Little River, segment 1	Woodstock	Bacteria	Contact Recreation	Source Unknown
Muddy Brook, seg 2	Woodstock	Unknown (nutrients)	Aquatic Life	Agriculture, Source Unknown
North Running Brook	Woodstock	Unknown (nutrients)	Aquatic Life	
Kahn Brook	Bozrah	Bacteria Unknown (nutrients)	Contact Recreation Aquatic Life	Agriculture, Intensive Animal Feeding Operations, Source Unknown
Spaulding Pond	Norwich	Bacteria	Contact Recreation	
Batterson Park Pond	New Britain, Farmington	Nutrients	Contact Recreation	Erosion and Sedimentation,

				Highway/Road/Bridge Runoff, Urban Runoff/Storm Sewers, Waterfowl
Angus Park Pond	Glastonbury	Bacteria	Contact Recreation	Waterfowl
*Gay City Park	Hebron	Bacteria	Contact Recreation	Waterfowl, Animal Pet Waste?
Coginchaug River, segments 4-6	Middlefield, Durham	Bacteria	Contact Recreation	Waterfowl, Agriculture, Crop-related Sources, Intensive Animal Feeding Operations, Natural Sources, Waterfowl
*Summer Brook	Middletown	Turbidity	Aquatic Life	
Farm River, segment 2	North Branford	Bacteria Unknown (nutrients)	Contact Recreation Aquatic Life	Agriculture, Grazing related Sources, Intensive Animal Feeding Operations, Source Unknown
Branford Supply Pond West	Branford	Siltation et al	Aquatic Life	Bank and Shoreline Modification, Erosion and Sedimentation, Habitat Modification, Urban Runoff/Storm Sewers
*Chatfield Hollow	Killingworth	Bacteria	Contact Recreation	Waterfowl, Animal Pet Waste?
*Meeting House Brook	Wallingford	Turbidity	Aquatic Life	Waterfowl, Animal Pet Waste?
Wharton Brook	Wallingford	Bacteria	Contact Recreation	Construction, Erosion and Sedimentation, Golf Courses, Land Development, Source Unknown, Urban Runoff/Storm Sewers
Edgewood Park Pond	New Haven	Bacteria	Contact Recreation	Debris and Bottom Deposits, Erosion and Sedimentation, Habitat Modification, Urban Runoff/Storm

				Sewers, Waterfowl
Wepawaug, seg 1-2	Milford	Bacteria	Contact Recreation	Waterfowl, Source Unknown
Mill Brook, segment 2	Cornwall	Unknown (nutrients)	Aquatic Life	Agriculture, Grazing related Sources, Source Unknown
Upper Steele Brook	Waterbury	Iron precipitation	Aquatic Life	Channelization, Hydromodification, Landfills, Source Unknown, Urban Runoff/Storm Sewers

***Waters for potential 319-funded restoration projects which are not on the 2004 303(d) list but have a high potential of being listed next cycle.**

Additional Details on FY2006 Priorities:

For the **Thames Basin funding**, CT DEP is interested in projects that directly address impairments in the Thames River Basin identified on the Impaired Waters List. CT DEP is particularly interested in addressing the nutrient impairments in that basin.

Projects that help develop **TMDLs or Watershed-Based Plans** (meeting criteria in the new EPA guidance and in concurrence with CT DEP) in the Thames Basin, and in other watershed listed on the Impaired Waters List are also encouraged this year. CT DEP suggests that applicants consult with CT DEP's basin coordinators before proposing any TMDL or watershed-based planning project. Please contact the coordinator listed below:

- Western Coastal Coordinator - Chris Malik (860) 424-3959
- Housatonic Coordinator - Susan Peterson (860) 424-3854
- Central Coastal and Connecticut Coordinator - Sally Snyder (860) 424-3869
- Thames Coordinator - Eric Thomas (860) 424-3548

CT DEP's priorities for TMDL projects include the following:

- Projects involving monitoring of bacteria impaired waterbodies;
- Lake monitoring projects to establish trophic conditions and/or nutrient loading; and
- Projects aimed at mitigating shellfishing impairments, eutrophication, and habitat loss (i.e. eelgrass, wetlands) of coastal and nearshore embayments.

These projects are applicable to water bodies included on the "*List of Connecticut Water bodies Not Meeting Water Quality Standards 2004*". Contact Kelly Streich at (860) 424-3864 for hard copies of the report or for additional information regarding TMDL projects.

For **implementation projects**, investigators should be familiar enough with the selected watershed to be ready to document benefits, usually in terms of pollutant load reduction or attainment of water quality standards, of the proposed Best Management Practices (BMPs). These projects should be capable of being implemented with a minimum of planning and investigators should show that application of the selected BMPs will result in demonstrable improvements in water quality that contribute to the resolution of the problem identified on the Impaired Water Body list. If the proposed FY2006 activity is part of a multi-year or phased project, applicants shall provide rough estimates of the **complete cost** of remediating the impairment of the project water body. CT DEP is receptive to a phased approach, with each year's funding allotment representing an individual phase. However, applicants should recognize that each year or phase of funding will be competitive – **CT DEP does not agree to fund future phases by committing to the initial phase**. Proponents shall establish a schedule for the additional phases and costs needed to complete the job, which will be considered in the evaluation of the FY2006 portion.

In the past, CT DEP has used §319 funds to support projects for monitoring, modeling, assessment, demonstration, habitat restoration, technical assistance, public outreach, education and involvement, and watershed management relevant to the control of nonpoint source pollution. CT DEP intends to continue to support most of these activities **but at a substantially reduced portion of total grant funding than in past years**. However, monitoring activities connected to TMDL or Watershed-Based Plan development and implementation projects as discussed above are preferred over the ambient monitoring CT DEP has funded in the past.

Stormwater Projects:

The eligibility of §319 grants for permitted stormwater projects has been uncertain in past years, though some have been funded. However, with issuance of the CT DEP's general permit for Municipal Separate Stormwater Sewer Systems in 2004, federal law defines those systems as point sources and therefore most activities required by the permit are ineligible for §319 NPS funds. **CT DEP will consider projects to eliminate or reduce stormwater runoff whose activities are *not* requirements of CT's stormwater general permit** established pursuant to the National Pollutant Discharge Elimination System (NPDES) Phase 2 Stormwater Rule. If you are considering submitting a stormwater proposal, please contact Stan Zaremba at (860) 424-3730 to see if your project is eligible.

Pollutant Load Reduction Reporting:

As part of EPA's Grant Reporting and Tracking System (GRTS), DEP requires grantees to provide pollutant load reduction estimates for all NPS implementation projects. The grantee will also be responsible for providing an initial assessment to CT DEP in a prescribed format. If cost effective, the grantee may want to also consider field monitoring to strengthen final pollutant reduction data from implementation projects. A quality assurance project plan (QAPP) is required for all related monitoring and data

gathering. All QAPP's should be written according to one of the following guidance documents: http://www.epa.gov/quality/qapps.html. EXIT DEP The QAPP must be approved by CT DEP/US EPA prior to the commencement of this work. Investigators need to consider the cost to prepare and implement this plan in their budget. Please contact Stan Zaremba if you have questions about QAPP requirements.

In Conclusion:

The CT DEP is making the enhancements specified above in order to better focus §319 funding on directly achieving water quality improvements, as required by EPA. In addition, EPA's guidance for States' implementation of NPS management programs under §319, and for the award of §319 grants to States to implement those programs, is more restrictive than in the past. These guidelines apply to grants appropriated by Congress in fiscal year 2004 and in subsequent years. The guidelines continue EPA's policy of focusing a significant portion of §319 funds to address watersheds where NPS pollution has resulted in impairment of water quality. The remaining funds are to be used by States to assist in implementation projects to address all of the water quality threats and impairments caused by NPS pollution. See **Nonpoint Source Program and Grants Guidelines for States and Territories**. EXIT DEP

Eligibility Criteria

To be considered for funding, project **proposals must meet the following minimum requirements**:

1. Projects shall be relevant to and consistent with the above Program Priorities for FY2006.
2. Projects shall address activities that are identified in the Connecticut *Nonpoint Source Management Program*. (PDF, 213K)
3. Implementation measures shall address the prevention, control or abatement of NPS pollution. **Implementation projects shall:**
    - be directed at encouraging, requiring, or achieving implementation of best management practices (BMPs) to abate existing nonpoint sources, or be directed at preventing NPS pollution through better land use management; and
    - be feasible, practical and cost effective.
4. CT DEP will only consider projects related to the implementation of measures for the purpose of eliminating or reducing stormwater runoff whose activities are **not** specific requirements of CT's stormwater general permit, established pursuant to the National Pollutant Discharge Elimination System (NPDES) Phase 2 Stormwater Rule. Applicants interested in potential stormwater projects should examine CT's stormwater general permit.
5. The budget shall demonstrate that 40% of the project expenses is covered by non-federal matching funds (or in-kind services).
6. Proposals shall contain an appropriate method for evaluating the project results, with an emphasis on measurable environmental improvement. Project proponents

shall describe benefits of the project in terms of NPS pollutant load reduction (e.g., reductions in sediment, nutrients, etc.), as required by EPA GRTS reporting, and water quality improvement (e.g., ambient chemistry or meeting designated uses not previously met). If the proposed project involves the collection, analysis, or manipulation of environmental data and it is selected for funding, it will require a QAPP.

Selection Criteria

Projects will be evaluated and selected for funding based on the degree to which they address the following:

1. Addresses one or more of the stated NPS program priorities for FY2006;
2. Develops or implements a watershed-based or NPS TMDL implementation plan;
3. Demonstrates a clear understanding of the nature, extent, and severity of the NPS problem;
4. Has a high probability of success;
5. Describes projected benefits quantitatively (with an emphasis on measurable results);
6. Documents local support and participation (e.g., local funding or letters of support);
7. Involves interagency coordination (document cooperative agreement);
8. Is cost-effective;
9. Leverages other funding sources;
10. Demonstrates innovative practices and/or technologies;
11. Provides results that contribute to the statewide control of NPS; and
12. Completeness of proposal form.

Attachment 2 - FY2006 Application - Work Plan see: http://www.dep.state.ct.us/wtr/nps/appform.doc

Connecticut Department of Environmental Protection
79 Elm Street
Hartford, CT 06106-5127

FY2006 Application – Work Plan for the Nonpoint Source Management Grant Program

Funded under Section 319 (h) of the Federal Clean Water Act

(Form created March 2005)

Proposals may be submitted by any interested Connecticut public or private organization, including municipalities, nonprofit environmental organizations, regional water authorities/planning agencies, and watershed associations. **Proposals submitted in response to the FY2006 RFP must be postmarked or received electronically by August 31, 2005 Proposals postmarked or received electronically after August 31, 2005 will not be considered for FY2006 funding.**

Please use this form when submitting a proposal. You may attach additional information or documentation to the proposals. **Project proponents whose proposals are selected for potential funding may need to submit a final work plan.** For questions or additional assistance call Stan Zaremba at (860) 424-3730.

Important note: **DEP may require each successful applicant to provide additional information in a final work plan to ensure that each project is sufficiently documented.**

FY2006 §319 Application and Work Plan Form (Preproposal)

PROJECT TITLE/BRIEF SUMMARY/BASIN LOCATION – Descriptive name and location of the proposed project.

PROJECT TITLE:			
BRIEF PROJECT SUMMARY: (Keep to three or four sentences long please)			
DESCRIBE LOCATION: ie. town, street, site. Note: A site map must be included with this application. A site map is not necessary if the project is non-site specific or statewide.			
MAJOR BASIN:			
PRIMARY REGIONAL BASIN # & NAME:			

RESPONSIBLE FOR IMPLEMENTATION OF THE PROJECT – This person will be considered the project manager (if applicable fill in co-manager section.

PROJECT MGR. NAME/TITLE:			
AFFILLIATION:			
STREET ADDRESS:			
CITY, STATE ZIP:			
PHONE NUMBER:	( )	**FAX:**	( )
PROJECT MGR. NAME/TITLE:			
AFFILLIATION:			
STREET ADDRESS:			
CITY, STATE ZIP:			
PHONE NUMBER:	( )	**FAX:**	( )

ESTIMATED TOTAL COST AND NONFEDERAL SOURCES – Identify the amount of §319 funds requested (60%); nonfederal match (40%); and total cost of project (100%).

To calculate the amounts use the following **:**

Section 319 funds requested divided by .6 = Total cost

Total cost – Section 319 funds requested = 40% nonfederal match

60% -§ 319 FUNDS REQUESTED:	
40% - NONFEDERAL MATCH:	
100% TOTAL COST:	

PREVIOUS 319 FUNDING AWARDED TO GROUP? If yes, indicate below project name and fiscal year, award amount, and balance to date.

☐ **YES**	**NAME OF PROJECT:**					
	EXPECTED COMPLETION DATE:					
	$ AMT AWARDED:					
	$ BALANCE TO DATE:					
☐ **NO**	**§319 FUNDS HAVE NOT BEEN PREVIOUSLY AWARDED TO APPLICANT.**					

NOTE TO THOSE APPLICANTS PROPOSING IMPLEMENTATION OR RESTORATION ACTIVITIES:

According to federal guidelines, a watershed-based plan must be developed for the water body in question before implementation activities can be funded by § 319 funds. You will need to provide the following information in order to satisfy that requirement, consistent with guidance at: http://www.epa.gov/fedrgstr/EPA-WATER/2003/October?Day-23/w26755.htm

Please consult with DEP as to the level of commitment required to develop the watershed-based plan before implementation/restoration activities can begin.

IMPAIRMENT	**Identify causes and sources of nonpoint source impairment(s).**
LOAD REDUCTION	**Estimate expected load reductions and whether the impairment is fully addressed.**
MANAGEMENT MEASURES	**Describe the specific nonpoint source management measures to be applied.**
TECH ASSISTANCE & FINANCIAL ASSISTANCE	**Estimate needed technical and financial assistance by activity.**
PUBLIC INFORMATION & EDUCATION	**Describe public information and education efforts and their value to the project.**
MANAGEMENT MEASURES	**Provide an implementation schedule for NPS management measures.**
MILESTONES	**List the measurable milestones consistent with the implementation schedule.**

PERFORMANCE	**Provide a list of performance criteria that will be used to measure success.**
MONITORING	**Discuss how you plan on monitoring your project.**

CONSTRUCTION PROJECT/LONG TERM MAINTENANCE

If the project includes construction who is responsible for long-term maintenance?

INTERAGENCY COORDINATION, ROLES, AND RESPONSIBILITIES – Describe participation and commitments expected from other agencies and organizations.

QUALITY ASSURANCE QUALITY CONTROL – Will this project require a quality assurance quality control plan (QAPP).

☐ YES ☐ NO

If your proposed project involves the collection, analysis, or manipulation of environmental data and it is selected for funding, it will require a Quality Assurance Project Plan (QAPP). The QAPP must be approved by CT DEP/US EPA prior to the commencement of this work. Investigators need to include the preparation and implementation of this plan into their budget **All QAPP's should be written according to one of the following guidance documents :** http://www.epa.gov/quality1/qa docs.html

- **EPA Requirements for Quality Assurance Project Plans EPA QA/R-5, EPA/240/B-01/003, March, 2001**

guidance documents, and will be determined on a case-by-case basis.

Also note:

1. The use of "secondary data" to make environmental decisions requires a QAPP. Secondary data are previously collected data (which may have been collected by other entities, not just the current grantee). A good example is the use of previously collected data in a computerized model to develop new data, e.g., about estimated pollutant levels. This might fall under your "manipulation" criterion.
2. If project proponent provides "in kind" services, such as sample analysis or sample collection, instead of money, a QAPP is necessary.
3. If the project is conducted with the deliberate intent to provide the data to EPA for its use, a QAPP should be written.

TASKS, DELIVERABLE, ESTIMATED COST – List in sequence the major tasks, deliverables, and costs. A final project report is a required deliverable for every project identify, as appropriated, any

contracts to be awarded or Quality Assurance Project Plan (QAPP) plans as tasks. Any type of data analysis or data reporting will require a QAPP.

Task #	Description of Task & Deliverable	Cost § 319 funds

Estimated duration (How many months do you expect project to run - up to 2 year duration):

PUBLIC PARTICIPATION – Describe how this will be accomplished.

FY2006 §319 Final Work Plan Form Due 4/15/06

(To be filled out when DEP approves preproposal)

PROJECT TITLE/BRIEF SUMMARY/DETAILED DESCRIPTION/BASIN LOCATION – Descriptive name and location of the proposed project.

PROJECT TITLE:	
BRIEF PROJECT SUMMARY: **(Keep to three or four sentences long please)**	
DETAILED PROJECT DESCRIPTION: **Include "who, what, where, when and why" of the project and the steps that will be taken to insure that it will be successfully implemented.**	Who: What: Where: When: Why: Steps for success:
PROJECT DESCRIPTION CONTINUED - Documentation: If this project will implement one or more Best Management Practices (BMPs), include information on the BMP(s) that will be used and literature reference for its selection and proper design.	**If BMP Project:** What is/are the BMP(s)? Literature Reference for selection and proper design?
DESCRIBE LOCATION: ie. town, street, site, watershed. **Note: A site map must be included with this application. A site map is not necessary if the project is non-site specific or statewide.**	
MAJOR BASIN:	
PRIMARY REGIONAL BASIN # & NAME:	

SPONSOR INFORMATION – This is the Agency DEP will be contracting with /RESPONSIBLE FOR IMPLEMENTATION OF THE PROJECT – This person will be considered the project manager (if applicable fill in co-manager section.

SPONSOR NAME/MAILING ADDRESS/FISCAL OR	

ADMINISTRATIVE CONTACT/FEDERAL TAX ID NUMBER:			
PROJECT MGR. NAME/TITLE:			
AFFILLIATION:			
STREET ADDRESS:			
CITY, STATE ZIP:			
PHONE NUMBER and FAX:	( ) ( )	**Email address**	
PROJECT MGR. NAME/TITLE:			
AFFILLIATION:			
STREET ADDRESS:			
CITY, STATE ZIP:			
PHONE NUMBER and FAX:	( ) ( )	**Email address**	

ENVIRONMENTAL BENEFIT AND CAUSE OF IMPAIRMENT

ENVIRONMENTAL BENEFITS OF PROJECT: **Choose ONLY one of the following that best characterizes the environmental benefit most likely resulting if the proposed project is implemented successfully**	Eliminate an identified impairment throughout a watershed? ☐ Restore impaired waters or segments of impaired waters? ☐ Reduce NPS pollution but may or may not eliminate impairments? ☐ Protect stream or prevent NPS pollution? ☐ Other: Specify
CAUSES OF IMPAIRMENT ADDRESSED: **Choose ONLY one of the following that best characterizes the source of impairment that will be most directly addressed if the proposed project is successfully implemented.**	Targets impairments caused by hydromodification and resulting in silt or sediment. ☐ Targets NPS impairments caused by agricultural drainage and/or runoff and resulting nutrients, silt or sediment. ☐ Targets impairments caused by urban NPS sources ☐ Targets impairments caused by other NPS sources (specify)

ESTIMATED TOTAL COST AND NONFEDERAL SOURCES – Identify the amount of §319 funds requested (60%); nonfederal match (40%); and total cost of project (100%).

To calculate the amounts use the following **:**

Section 319 funds requested divided by .6 = Total cost

Total cost – Section 319 funds requested = 40% nonfederal match

60% -§ 319 FUNDS REQUESTED:	

40% - NONFEDERAL MATCH:	
100% TOTAL COST:	

PREVIOUS 319 FUNDING AWARDED TO GROUP? If yes, indicate below project name and fiscal year, award amount, and balance to date.

☐ **YES**	**NAME OF PROJECT:**					
	EXPECTED COMPLETION DATE:					
	$ AMT AWARDED:					
	$ BALANCE TO DATE:					
☐ **NO**	**§319 FUNDS HAVE NOT BEEN PREVIOUSLY AWARDED TO APPLICANT.**					

NOTE TO THOSE APPLICANTS PROPOSING IMPLEMENTATION OR RESTORATION ACTIVITIES:

According to federal guidelines, a watershed-based plan must be developed for the water body in question before implementation activities can be funded by § 319 funds. You will need to provide the following information in order to satisfy that requirement, consistent with guidance at: http://www.epa.gov/fedrgstr/EPA-WATER/2003/October?Day-23/w26755.htm

Please consult with DEP as to the level of commitment required to develop the watershed-based plan before implementation/restoration activities can begin.

IMPAIRMENT	**Identify causes and sources of nonpoint source impairment(s).**
LOAD REDUCTION	**Estimate expected load reductions and whether the impairment is fully addressed.**
MANAGEMENT MEASURES	**Describe the specific nonpoint source management measures to be applied.**
TECH ASSISTANCE & FINANCIAL ASSISTANCE	**Estimate needed technical and financial assistance by activity.**
PUBLIC INFORMATION & EDUCATION	**Describe public information and education efforts and their value to the project.**
MANAGEMENT MEASURES	**Provide an implementation schedule for NPS management measures.**
MILESTONES	**List the measurable milestones consistent with the implementation schedule.**
PERFORMANCE	**Provide a list of performance criteria that will be used to measure success.**

MONITORING	Discuss how you plan on monitoring your project.

CONSTRUCTION PROJECT/LONG TERM MAINTENANCE

If the project includes construction who is responsible for long-term maintenance?

INTERAGENCY COORDINATION, ROLES, AND RESPONSIBILITIES – Describe participation and commitments expected from other agencies and organizations.

MONITORING/QUALITY ASSURANCE QUALITY CONTROL – Will this project require a quality assurance quality control plan (QAPP).

☐ YES ☐ NO

If yes answer the following:

Will water chemistry monitoring be conducted with this project? ☐ YES ☐ NO

Will biological monitoring be conducted with this project? ☐ YES ☐ NO

Will habitat assessment monitoring be conducted with this project? ☐ YES ☐ NO

If your proposed project involves the collection, analysis, or manipulation of environmental data and it is selected for funding, it will require a Quality Assurance Project Plan (QAPP). The QAPP must be approved by CT DEP/US EPA prior to the commencement of this work. Investigators need to include the preparation and implementation of this plan into their budget **All QAPP's should be written according to one of the following guidance documents :** http://www.epa.gov/quality1/qa docs.html

- **EPA Requirements for Quality Assurance Project Plans EPA QA/R-5, EPA/240/B-01/003, March, 2001**

guidance documents, and will be determined on a case-by-case basis.

Also note:

4. The use of "secondary data" to make environmental decisions requires a QAPP. Secondary data are previously collected data (which may have been collected by other entities, not just the current grantee). A good example is the use of

previously collected data in a computerized model to develop new data, e.g., about estimated pollutant levels. This might fall under your "manipulation" criterion.

5. If project proponent provides "in kind" services, such as sample analysis or sample collection, instead of money, a QAPP is necessary.
6. If the project is conducted with the deliberate intent to provide the data to EPA for its use, a QAPP should be written.

PERMITS – Are permits needed to complete this project? If so, please list individually, indicating which permits are needed, whether they are local, state, or federal, and if these permits have been secured. Also, who is responsible for acquiring the permits?

☐ YES ☐ NO

Permit(s):

Person(s) Responsible:

TASKS, DELIVERABLE, ESTIMATED COST – List in sequence the major tasks, deliverables, and costs. A final project report is a required deliverable for every project identify, as appropriated, any contracts to be awarded or Quality Assurance Project Plan (QAPP) plans as tasks. Any type of data analysis or data reporting will require a QAPP.

Task #	Description of Task & Deliverable	Cost § 319 funds

Estimated duration (How many months do you expect project to run - up to 2 year duration):

PUBLIC PARTICIPATION – Describe how this will be accomplished.

FY2006 ESTIMATED BUDGET SHEET

Are §319 funds being used for salaries?	☐ YES – fill out §319 salary section. ☐ NO - skip to Match salary section.

§319 SALARY INFORMATION:

NAME	TITLE	ANNUAL SALARY	APPROX. % OF TIME	SALARY CHARGED TO PROJECT	% OF FRINGE	TOTAL

STATE/LOCAL/OTHER MATCH SALARY INFORMATION:*

NAME	TITLE	ANNUAL SALARY	APPROX. % OF TIME	SALARY CHARGED TO PROJECT	% OF FRINGE	TOTAL

		Total Project Costs 100%	§319 Costs 60%	State/loca other Mat 40%
Salary & Fringe	Includes salaries and fringe benefits paid for work performed on the project. "Salary" should reflect the rate per hour, by position. An employment benefit given in addition to one's wages or salary.			
Indirect Cost of Salary	Indicate the indirect costs. Typical indirect costs are associated with but are not limited to office space, telephones, personnel administration, accounting, and room or equipment rental and usage (i.e., the cost of doing business).			
Supplies	Includes office/field/lab supplies, data processing materials, books, paper and other office supplies, clothing, Include equipment costing less than $1,000 in total.			
Equipment	Includes a single item of equipment costing more than $1,000 in total. **(unit cost > $1,000 must be itemized below) ***			
Travel and Training	Includes project-related charges for travel activities (travel, tolls), and charges as a result of use of an auto. Vehicle costs should be shown as the number of miles times the mileage rate being applied. Mileage rates (cost/mile) cannot exceed the rate approved by the Connecticut State Department of Administrative Services rates for in-state travel.			
Contractual	Includes expenditures made to sub-grantees/sub-contractors, hired speakers, legal services, cost of engineering and design, etc. The rate of pay per hour, number of hours and type of service provided should be included. Any procured services not provided by the Sponsor should be listed here.			
Construction	Costs (construction contracts, cost share agreements, etc.) associated with construction. Permit fees can be included.			
Other (specify)	Includes postage, printing, license fees, equipment maintenance and repair, computer software, non-staff insurance. **(unit cost > $1,000 must be itemized below) ***			
	Totals			

* List equipment > $1,000:	
* List other expenses:	

* If needed, the applicant may wish to investigate a possible method to assign an in-kind match for volunteer work performed. See: Independent Sector calculation http://www.independentsector.org/programs/research/volunteer_time.html

Connecticut Nonpoint Source Grant Administrative Guidelines

Nonpoint Source Grants Program

March 2006

Connecticut Department of Environmental Protection
Bureau of Water Management
Planning & Standards Division
Nonpoint Source
Hartford, CT 06106
(860) 424-2379

Connecticut Nonpoint Source Grant Administrative Guidelines

Nonpoint Source Grants Program

CONTENTS

ATTACHMENTS

NPS Grant Administrative Guidelines

Connecticut Nonpoint Source Grants Program

Authorities

Clean Water Act (CWA), Title III, Section 319(h) http://www.epa.gov/owow/nps/cwact.html

United States Code - 33USC Sec. 1329 Nonpoint source management programs

The Catalog of Federal Domestic Assistance (CFDA) 66.460 Nonpoint Source Implementation Grants

Federal Register:

- 2 CFR Subtitles A and B Government wide Guidance for Grants and Agreements; Federal Agency Regulations for Grants and Agreements, Final Rule;
- 2 CFR Part 215 Uniform Administrative Requirements for Grants and Agreements With Institutions of Higher Education, Hospitals, and Other Non-Profit Organizations (OMB Circulars A-110); Final Rule;

Office of Management and Budget Circulars: See http://www.whitehouse.gov/omb/circulars.

EPA Administrative Guidelines

Applying for and Administering CWA Section 319 Grants: Nonpoint Source Program and Grants Guidelines for States and Territories http://www.epa.gov/fedrgstr/EPA-WATER/2003/October/Day-23/w26755.htm.

Definitions

Agreement: Contract/MOU/MOA/Contribution Agreement. Once the Agreement is initiated, the Grantee will subsequently be referred to as Contractor.

CWA: Clean Water Act.

DEP: Connecticut Department of Environmental Protection.

DEP NPS Coordinator: DEP staff person assigned to manage CT 319 Nonpoint Source Program.

EPA: Environmental Protection Agency.

Grant Award: Approved CWA Section 319 Grant Award Application.

Grantee: Affiliation that submitted a work plan that was approved in an EPA Grant Award.

NPS: Nonpoint Source.

Work Plan: Project work plan submitted in the approved Grant Application.

EPA CT NPS Coordinator: EPA staff person assigned to assist DEP manage the CT 319 NPS Program.

Purpose

Grantees conducting a Nonpoint Source Pollution Control Project are obliged to administer the project in accordance with the Grant Award and Agreements. The Grant Award requires Grantees to use these Guidelines to comply with reporting requirements.

These Guidelines: (1) detail reporting requirements, and (2) provide other information to help Grantees administer a NPS project to comply with the Grant Award.

Section 1. Grantee Responsibilities

A. Agreement – Refer to Attachment E, Agreement - Example

Grantees are obliged to administer the project in accordance with the Grant Award and the Agreement. The following Conditions/Requirements and Appendix's are included in the Agreement (dependent on type of project):

Agreement Conditions/Requirements

Appendix A. Scope of Work (from the approved work plan)
Appendix B. Schedule of Payments
Appendix C. Quarterly Report Format
Appendix D. Final Report Format
Appendix E. Non-federal Match Documentation Form and Instructions
Appendix F. Invoice/Request for Payment
Appendix G. NPS Site Report

B. Summary of Grantee Responsibilities

This section is a summary of Grantee responsibilities for administering an Agreement.

Use this document, the Agreement or contact the DEP Nonpoint Source Coordinator (DEP NPS Coordinator) for further information about Grantee responsibilities.

1. Conduct the project or program activities as described in the Agreement.
2. Conduct the project activities at the pace necessary to complete the project according to the Agreement.
3. Send all reports, correspondence, deliverables, invoices, etc to the DEP NPS Coordinator or contact the DEP NPS Coordinator for assistance with any questions. Refer to Attachment E, Agreement - Example, Appendix A, Scope of Work, paragraph #4.
4. Maintain an active cooperative working relationship with the DEP NPS Coordinator. Keep the DEP NPS Coordinator informed of project activities. DEP wants to help solve problems before they become unmanageable and be informed about activities that are particularly successful.
5. Notify DEP as soon as possible if changes to the Agreement are needed to effectively conduct the project. If necessary, request and secure DEP acceptance of changes in the Agreement. Refer to Section 6, Changes in the Work.
6. Prepare and submit the deliverables listed in the Agreement according to guidelines in Section 3, Project Deliverables. Deliverables are listed in the Agreement. Deliverables are key materials or products developed under the project that demonstrate work activity and/or outcomes.
7. Provide Reports to DEP - Progress Reports, Final Project Report and other reports if specified in the Agreement. These Grant Administrative Guidelines provide detailed instructions for report preparation and handling. See Section 12, Progress Reports.
8. Use these NPS Grant Administration Guidelines to help administer the Agreement.
9. Organize / record non-federal match information (provider, activity, valuation, total value) as match is accumulated during the project to help ensure the match is adequately documented

upon project completion. Contact your DEP NPS Coordinator if you are unsure of any aspect of match calculation or recordkeeping. Refer to Attachment E, Agreement - Example.

10. Prepare Requests for Invoice/Payment according to instructions in Section 9. Submit Requests for Invoice/ Payment to the DEP NPS Coordinator.
11. Maintain a financial management system to permit the tracking of funds to a level of expenditure adequate to establish that funds have be expended on allowed activities and purposes under the Agreement.
12. Follow applicable Federal Office of Management and Budget (OMB) cost principles, agency program regulations, and the terms of the Agreement. Costs charged to the grant must be reasonable and allowable costs. Follow federal cost principles applicable to the type of organization (governments, Federal OMB Circular A-87; nonprofits, Circular A-122; or educational institution, Circular A-21). Grantees may not incur costs before the effective date of the Agreement. Circulars are at http://www.whitehouse.gov/omb/circulars.
13. Submit an audit report to the DEP if the Grantee receives more than $500,000 in funds from all federal sources within a fiscal year. Refer to the Agreement Contract Conditions/Requirements for more information.
14. Maintain all correspondence, documents, deliverables, payroll & accounting records and other materials pertaining to the Agreement. Allow inspection of pertinent documents by DEP or other authorized representative of the State of Connecticut or the federal government.

Section 2. DEP Responsibilities

A. Grantee Monitoring

DEP is responsible for monitoring the Grantee use of the Grant Award through site visits or other means to provide reasonable assurance that (1) project goals are achieved and (2) the Grantee administers the Grant Award in compliance with terms of the Agreement. Monitoring activities normally occur throughout the year and may take various forms, such as:

1. *Reporting* - Reviewing performance reports and invoices submitted by the Grantee.
2. *Site Visits* - Performing site visits at the Grantee Office and in the field to observe operations, and review project and financial records.
3. *Contact* - Regular contacts with Grantees and appropriate inquiries concerning program / project activities.

B. DEP

DEP designates a staff person to serve as DEP NPS Coordinator and to serve as DEP's representative (agency contact person) to help guide the project and monitor Grantee performance on the Agreement. The DEP NPS Coordinator will help ensure that work is carried out according to the Agreement by conducting site visits, reviewing deliverables, and helping to address any problems or questions. The following list highlights DEP's responsibilities for monitoring the Agreement:

1. Provide or coordinate DEP consultation to help the Grantee successfully implement the Agreement and comply with the Grant Award
2. Monitor the Grantee to provide reasonable assurance that the Grantee achieves project goals and administers the Agreement in compliance with terms of the Grant Award.
3. Discuss with the Grantee within 2 months of project start-up to review the Agreement, Project Work Plan, and the NPS Grant Administrative Guidelines to help ensure the Grantee understands their responsibilities and is prepared to effectively administer the project.

4. Discuss and/or meet with the Grantee periodically to discuss project status.
5. DEP/EPA can go onsite in the field to observe the NPS sites treated (construction sites) using project funds and other relevant sites.
6. Receive, acknowledge, review and handle all submissions from Grantee in a timely manner including:
    a. Progress Reports;
    b. Deliverables;
    c. Requests for Invoice/Payment;
    d. Final Project Report;
    e. Non-federal Match documentation.
7. If necessary prompt the Grantee to help ensure the project is proceeding as scheduled and Reports required by the Agreement are provided to DEP.
8. Document key contacts with a Grantee (site visits, meetings etc.) in writing for the DEP project file to exhibit DEP monitoring of the project.
9. Maintain a project file containing relevant documentation materials.
10. Closeout the Agreement and request EPA approval to closeout the project.

C. Grantee & DEP Cooperation

Developing a good working relationship between the Grantee and the DEP NPS Coordinator is advantageous so that each understands the other's needs and duties. In some cases a Grantee and the DEP NPS Coordinator may prefer to work closely together on many aspects of the project, such as training sessions, evaluating NPS sites, engaging stakeholders, and so on. At other times it may be preferable for DEP to remain more distant, but still available to provide assistance upon request. The best approach should be determined on a case-by-case basis by the DEP NPS Coordinator and the Grantee with the mutual goal being to implement the project as effectively as possible.

Section 3. Project Deliverables

"Deliverables" are specific products generated by the Grantee during a NPS project. Deliverables are clearly identified and listed in project Work Plans under the heading "DELIVERABLES", and the Agreement under Appendix A. Refer to Attachment D, Work Plan – Example, and Attachment E, Agreement – Example. Deliverables must be submitted, reviewed, and approved to complete a project and closeout an Agreement. If needed, Grantees should review the content of a deliverable with DEP NPS Coordinator for acceptability prior to formally submitting a Deliverable to DEP.

A. Submitting Deliverables

A "Deliverable" should be submitted by the Grantee when it is completed. Do **not** wait until a Progress Report is due. Deliverables should be submitted as follows:

1. The Grantee sends the Deliverable, as required in the Agreement, directly to the DEP NPS Coordinator.
2. The Grantee shall submit two copies of the final deliverable (Final Report) to DEP. DEP will submit one copy of the final report to EPA.

B. Labeling Deliverables

Deliverables must be clearly labeled with the appropriate Project ID number, the project title and the deliverable/task number from the Agreement. This is important so the Grantee, DEP and EPA will readily recognize a Deliverable in the project file.

Example Label for a Deliverable:

Section 4. Procurement

In some projects, a Grantee may need to purchase goods or services to conduct project activities. Procurement means obtaining or acquiring goods or services. Procurements with federal funds must be made on a competitive basis to ensure that fair and reasonable prices are obtained for goods and services. Grant recipients may use their own procurement procedures provided that the procedures conform to applicable federal law and standards as described in 40 CFR 31.36. These regulations describe 4 procurement methods: small purchase procedures; sealed bids; competitive proposals and noncompetitive proposals.

Procurements of less than $100,000 may be conducted using small purchase procedures. Small purchase procedures are those relatively simple and informal procurement methods for securing services, supplies, etc. Small purchase procedures require that price or rate quotations must be obtained from an adequate number of qualified sources. Standard practice is to document price or rate quotations from 3 or more qualified sources.

Procurement methods using federal funds are specified in the Code of Federal Regulations at 40CFR 31.36 http://www.gpoaccess.gov/cfr/retrieve.html.

Section 5. Problem Resolution

The DEP NPS Coordinator is involved in project activities to the extent of reviewing deliverables, progress reports and invoices, attending occasional meetings, and providing advisory support and technical assistance. Grantees are responsible for implementing the Agreement. Problems such as unforeseen loss of staff, prolonged bad weather, equipment breakdown, etc, are not unusual and may affect the Grantee's ability to meet Agreement requirements. In such cases more hands-on interaction between Grantee and DEP may be needed to help keep project activities on track. Minor or temporary delays are usually resolved through mutual cooperation between the Grantee and the DEP NPS Coordinator.

More significant problems may develop where the project work is not progressing satisfactorily. Examples of potentially serious problems / deficiencies include: repeated failure to complete Agreement tasks; reports or related documentation repeatedly not submitted or of poor quality; project work changed without notice or not performed according to the Agreement; poor budget management, unsubstantiated project costs; etc. If the problem cannot be resolved between the DEP NPS Coordinator and Grantee, then the DEP NPS Coordinator should request assistance from EPA. If problems cannot be resolved DEP/EPA have the right to cancel the Agreement.

DEP/EPA also reserve the right to reprogram **awarded funds** if the Grantee fails to initiate their project within a two-year period from the approval date of the Grant Award.

Section 6. Changes in the Work

Grantees may need to make changes in the project work to respond to various changed conditions. Agreements have a standard provision regarding changes in the work. Refer to Attachment D, Work Plan - Example.

A. Changes

A Grantee is obliged to generally conduct the project or program activities described in the Agreement. Grantees generally have considerable latitude to "do what it takes" to accomplish the objectives of the project. As project work proceeds, the Grantee and/or DEP NPS Coordinator may determine that it is necessary or appropriate to make changes in the Agreement and/or the project work plan (such as: tasks, deliverables, budget or schedule). Changes in the work must be

documented in writing between the Grantee and the DEP NPS Coordinator. Prior to changes in the work, the Grantee should provide a letter to request DEP acceptance of the changes. The DEP NPS Coordinator will request EPA approval (if necessary) and will reply in writing to advise if the changes are accepted or are not accepted. If accepted, DEP will amend the Agreement.

An Agreement amendment must be signed by the Grantee, DEP and approved by the Connecticut Attorney General's Office. An amendment to the Agreement is needed prior to implementing the substantial changes in work.

Refer to Attachment A, Revised Work Plan for information on how to amend a Work Plan.

Refer to Attachment B, Amendment to an Agreement for information on how to amend an Agreement.

Section 7. Grants Reporting and Tracking System (GRTS)

GRTS is a Web-enabled data system that allows states and EPA to manage and report data on Nonpoint Source grants on a national level. A GRTS form must be completed by each Grantee. Contact the DEP NPS Coordinator for current form and instructions (form is updated annually to include new national requirements). The form is located at http://www.dep.state.ct.us/wtr/nps/grts.doc.

Section 8. Quality Assurance Project Plan (QAPP)

A Quality Assurance Project Plan documents the planning, implementation, and assessment procedures for a particular project, as well as any specific quality assurance and quality control activities. It integrates all the technical and quality aspects of the project in order to provide a "blueprint" for obtaining the type and quality of environmental data and information needed for a specific decision or use. All work performed or funded by EPA that involves the acquisition of environmental data must have an approved QAPP. The Grantee must coordinate QAPP's development via the DEP NPS Coordinator. DEP and EPA must review all QAPPs prior to the commencement of any monitoring component of the project. All QAPPs shall be written in conformance with EPA guidance. To access these and other quality assurance documents, please refer to the following websites: http://www.epa.gov/region1/lab/qa/pdfs/QAPPProgram.pdf

Section 9. Invoices and Payments

Payments are described in the Agreement. Refer to Attachment E, Agreement – Example.

A. Submitting an Invoice Request to DEP

Grantees requesting payment must complete and submit the Request for Invoice/Payment Form according to instructions provided by DEP. Refer to Attachment E, Agreement – Example.

B. DEP Review of Invoices

1. **The DEP NPS Coordinator will**:
   i. Review the Invoice for acceptance within 3 weeks of receipt; and
   ii. Inform the Grantee if the Invoice is not accepted within that 3-week time frame.
2. **Acceptance criteria**. The DEP NPS Coordinator will review the Invoice. An Invoice will be accepted if:
   i. The appropriate Invoice/Request For Payment form is completed according to instructions;
   ii. The DEP NPS Coordinator finds the Grantee exhibits adequate compliance and performance according to terms of the Agreement;

iii. Progress Reports due to DEP have been received and accepted; and

iv. Partial payment request includes an adequate explanation that is accepted and approved by DEP.

3. **Request for Payment - Accepted**.

i. Review of payment generally includes the following DEP staff: Business Officer; Project Manager, Project Coordinator, Director of the Bureau of Water Management, and Bureau of Financial and Support Services.

C. Final Payment

Grantees may request the final payment upon submission of the Final Project Report. The DEP NPS Coordinator will accept the final invoice provided the Final Project Report and or final product(s), non-federal match & deliverables required under the Agreement are satisfactory.

Section 10. Non-Federal Match

Grantees are obliged to document non-federal matching funds or services contributed to the project. The amount of non-federal match required is listed in the Agreement and the project work plan under "Budget Information". Grantees should have a systematic approach to accumulate and document match as the project proceeds. Grantees must submit documentation of non-federal project match as part of the Final Project Report. Refer to Attachment E, Agreement – Example. Final Project Report for information on how to document match. The Grantee may elect to submit match documentation with each invoice request for payment.

A. Description

Match is the value of funds or services used to help conduct the NPS Project that is not borne by the federal NPS grant funds. Match includes, but is not limited to, contributions of cash or value of services from individuals, organizations, municipalities or *non-federal* public agencies. Federal funded projects or services **cannot** be used as match for NPS grants.

Funds or services contributed to the project as match must:

1. Be eligible under EPA National 319 Program Guidelines. See: Nonpoint Source Program and Grants Guidelines for States and Territories http://www.epa.gov/fedrgstr/EPA-WATER/2003/October/Day-23/w26755.htm;
2. Relate directly to the tasks in the Agreement;
3. Be reasonably valued for the work performed; and
4. Be supported by documentation.

Match may be cash or the value of "in-kind" non-cash contributions such as charges for equipment used on the project or the value of goods and/or services directly contributed to the project. Third party "in-kind" contributions may be provided by non-federally funded public agencies, organizations or individuals. Volunteer services provided by individuals to the Sponsor for project activities and travel costs may be valued as match *at rates consistent with rates ordinarily paid by employers for similar work.* The Sponsor must certify in writing that all project match has been met before project closure.

Examples of items that might be used as eligible match include**:**

1. Cost of construction of approved BMP's (including labor, equipment and materials);
2. Cost or "value per hour" rate, multiplied by the number of hours of work performed to help carry out project work plan tasks, such as: serving on the project Steering Committee; writing, copying and mailing water quality publications or watershed newsletters;

participating directly in project activities; providing training or workshop sessions; designing or reviewing BMP or conservation plans, etc. The value per hour rates for the volunteer services must by reasonably valued for the level of project work performed; and

3. Services contributed by volunteers that relate *directly* to the application of tasks in the project work plan.

For example, the value of time spent making a training presentation called for by a work plan task is eligible as match. However, a person simply attending a presentation as part of the general audience is not eligible as match.

1. Cost of travel. Travel rates cannot exceed that State of Connecticut rate in effect. See http://www.gsa.gov/Portal/gsa/ep/home.do?tabId=0; and
2. Cost of office or field equipment rentals, and supplies used for the project.

B. Documentation of Non-federal Match

The Grantee must certify in writing that all project match has been documented before closeout of the project. A Grantee should accumulate match information in a table as the project proceeds so one can efficiently summarize non-federal match. The following information should be recorded to document match:

1. **Date** - List the date associated with the match where applicable (dates must be within the agreement period;
2. **Source** - Identify the source of funds or services (person, group, business etc.);
3. **Activity or Item** - Describe the activity (steering committee meeting, construction etc.);
4. **Hours** - Number of hours for work associated with activity;
5. **Rate or Value** - The value of the activity or item in dollars or dollars/hour;
6. **Subtotal** - The number of hours x rate;
7. **Mileage** -The number of miles x current State of Connecticut Government rate http://www.gsa.gov/Portal/gsa/ep/home.do?tabId=0;
8. **Total** - Total of all columns; and
9. **Valuation of Activities/Items** - Identify the basis for the dollar value assigned to the activity or item.

Section 11. NPS Site Report

Grantee shall prepare a brief NPS Site Report to describe pre and post construction site conditions at NPS site(s) when grant funds or matching funds are used to pay for construction. NPS Site Reports are needed to document the use of project funds for construction. These reports must briefly describe:

- The NPS site before and after the BMP installation NPS Problem? Solution? Attach a sketch or photo depicting "before" and "after" conditions;
- Any action to demonstrate the value of the BMP to others;
- Or summarize to indicate who will be responsible and how the BMPs at the NPS Project site will be inspected and maintained;

The Agreement for a NPS Watershed Project usually specifies NPS Site Reports as a project deliverable. Grantees should submit NPS Site Reports to DEP within 2 months of completion of the site work. Refer to Attachment E, Agreement – Example.

Section 12. Progress Reports

Purpose

The Agreement requires Grantees to submit progress reports. DEP uses progress reports to monitor Grantee progress and performance. Federal regulations require monitoring Grantee use of federal awards to provide reasonable assurance that the Grantee achieves project goals and administers the Agreement in compliance with terms of the Grant Award.

A. Preparing a Progress Report – Quarterly Report

The Progress Report should concisely summarize important work activity performed within a 3-month reporting period using the following format:

1. Project Number and Title;
2. Task #;
3. And the following information for each task:
   a. Performance/Milestone Summary: A listing of major program and project accomplishments for the period, as well as progress made toward meeting future milestones.
   b. Slippage Reports: Provide reasons for delays in meeting schedule milestones/commitments and discuss what actions (State, Federal or other) will be taken to resolve any current or anticipated problems.

B. Submitting a Progress Report to DEP

1. Progress Reports are to be sent directly to the DEP NPS Coordinator.
2. Due dates and reporting periods are:

   March 15th - Report activity for the 3 month period, December 1st – February 29th ;

   June 15th Report activity for the 3 month period, March 1st to May 31st;;

   September 15th - Report activity for the 3 month period, June 1st – August 31st; and

   December 15th Report activity for the 3 month period, September 1st to November 30th.
3. Progress Reports may be submitted by electronic document (preferred) or paper copy. Use document software compatible with Microsoft Word.
4. Grantees must retain a copy of Progress Reports for their project file.

C. DEP Review of Progress Reports

1. **The DEP NPS Coordinator will**:
   a. Review Progress Reports for acceptance and inform the Grantee whether the Progress Report is accepted or not accepted within 3 weeks of receipt;
   b. If needed, contact the Grantee to discuss questions in report content and/or format and work together to make needed changes as soon as possible;
   c. If a Grantee fails to submit a progress report by the due date, the DEP NPS Coordinator should remind the Grantee about the contractual obligation to submit a Progress Report and that DEP will not process payments unless Progress Report(s) are accepted by the DEP.
2. **Acceptance Criteria**. The DEP NPS Coordinator will review the progress report to determine whether the report is acceptable. A Progress Report will be accepted if the report:

a. Reasonably describes the work accomplished during the period, and;
b. Was prepared according to the instructions for content and format.

3. **Report - Accepted**. When the DEP NPS Coordinator determines the progress report is acceptable, the report will be filed in the NPS file. The DEP NPS Coordinator may accept a Progress Report with *minor* deficiencies following discussion and correction of the deficiencies on the report in a manner mutually acceptable to the DEP NPS Coordinator and the Grantee.
4. **Report - Not Accepted**. The DEP NPS Coordinator will inform the Grantee why the report is not acceptable.
5. **Payment Hold**. DEP will not issue a payment if the Grantee fails to provide Progress Report(s) that are accepted by the DEP. Payments can resume once overdue reports are turned in and accepted or problems are addressed in reports that were previously not accepted.
6. **Project Slippage**. The DEP NPS Coordinator may find that the Progress Report(s) indicate that the project is not proceeding in at the pace necessary to complete the project according to the Agreement or there are some other problems. If so, the DEP NPS Coordinator should contact the Grantee to determine why the project is not proceeding as planned and take action to resolve the matter. For guidance, refer to Sections 5 & 6 "Problem Resolution" and "Changes in Work". DEP may withhold payments if Grantee does not exhibit adequate compliance and performance according to terms of the Agreement.

Section 13. Final Project Report

The Agreement requires the Grantee to submit a Final Project Report (FPR) to DEP when the project ends. The purpose of a Final Project Report is to document completion of the project and closure of the Agreement. The Grantee must submit a draft Final Project Report to the DEP NPS Coordinator for review and comments prior to submitting the FPR.

The FPR should summarize the work accomplished and outcomes of the project. These reports are used as reference sources for providing project information to DEP, EPA, the public and other users. The FPR should provide an easily understood, stand-alone, concise reference source that describes all important activities and outcomes of the project. Refer to Attachment E, Agreement – Example.

Section 14. Closeout of Agreement

DEP must document closeout of the Agreement when the project ends due to completion or termination. DEP will review the Final Project Report and information in the project file to verify that the Grantee performed project work in accordance with the terms of the Grant Agreement. DEP will check the following:

1. Project tasks in the Agreement were implemented;
2. Project Deliverables are acceptable and in the project file;
3. Any other reports or documentation required are completed and in the project file;
4. The Final Project Report is accepted and in the project file;
5. The Grantee and the DEP find that the grant fund accounts balance is acceptable and any non-federal match required is met; and
6. If there is a remaining balance, then the Grantee must return the funds to DEP within 90 days of project completion date.

DEP Closeout Acknowledgement

DEP will acknowledge completion of the Agreement by letter to the Grantee, when DEP finds the Grantee has exhibited adequate performance and compliance according to terms of the Agreement.

DEP will notify the Grantee by letter to document acceptance of the Final Project Report and/or final product. The close out letter should state that the Grantee has satisfactorily completed project work and administrative requirements as listed in the Agreement. See Attachment E, Agreement - Example for an example of a Closeout Letter.

Section 15. Non-performance of Work Plan and or Agreement

If the Grantee does not perform in accordance with the work plan or Agreement, and both the DEP NPS Coordinator and Grantee have failed to reach a resolution, then DEP will initiate a formal letter of cancellation to the Grantee for non-performance of the Agreement or work plan.

Attachment A
Revised Work Plan

WHAT IS A REVISED WORK PLAN?

A revised work plan is a formal adjustment of an existing EPA approved NPS grant application project work plan reflecting a significant change in the scope of work, budget, resources, or circumstances relating to that project. Revisions constitute recognition and documentation by the Grantee and by the DEP, of mutually agreed-upon changes to an approved work plan.

WHEN IS A REVISION NEEDED?

A Revision is needed when there is a substantial change in the scope or objectives of the approved work plan or a change is needed in the total work plan dollar amount. The most common reasons for requesting a revision is to reflect changes to work or expenses that substantially differ from the approved work plan.

HOW DOES THE REVISION PROCESS WORK?

The revision process is much like a normal work plan approval process. Once the need for a revision is determined and the revision request is made by the Grantee to the assigned DEP NPS Coordinator, then DEP will help the Grantee to prepare a revised work plan and submit it to EPA for approval.

WHAT INFORMATION IS NEEDED TO REQUEST A REVISION?

The Grantee must provide a request letter (electronic or hard copy), signed by the Grantee's authorized representative. The letter must include:

(1) The project ID # and title for which the revision is being requested;
(2) A statement requesting a revision to the work plan;
(3) Background information explaining why the changes are needed; and
(4) A revised work plan form http://www.dep.state.ct.us/wtr/nps/proposalrequest.htm.

WHEN SHOULD A REVISION REQUEST BE SUBMITTED?

Revision requests should be submitted as soon as possible after the need is determined. This is to allow sufficient time for planning, review, and processing of the request.

HOW MUCH TIME DOES IT TAKE TO PROCESS A REVISION?

The time needed to review and approve Grantee's revision request varies. Provided the information submitted is clear and thorough, a revision request typically takes about 4 to 6 weeks to process.

Attachment B
Amendment to a Agreement

WHAT IS AN AMENDMENT?
An amendment is a formal adjustment of an existing NPS project Agreement reflecting a significant change in the scope of work, budget, resources, or circumstances relating to that project. Amendments constitute recognition and documentation by the Grantee and by the DEP, of mutually agreed-upon changes to an existing Agreement.

WHEN IS AN AMENDMENT NEEDED?
An amendment is needed when there is a substantial change in the scope or objectives of a project or a change is needed in the total Agreement amount. The most common reasons for requesting an amendment is to extend the project timeframe past an approaching Agreement expiration date, or to reflect changes to work or expenses that substantially differ from the approved Agreement. **Time extensions will be granted on a limited basis.**

HOW DOES THE AMENDMENT PROCESS WORK?
The amendment process is much like a normal Agreement process. Once the need for an amendment is determined and the amendment request is made by the Grantee to the DEP NPS Coordinator. DEP will review the request for acceptability and secure approval from EPA if applicable. DEP will prepare the amendment to the Agreement and forward it to the Grantee for review and signature. After receipt of the signed Agreement from the Grantee, DEP will process for final approval. Upon final signature, an approved amended Agreement will be forwarded to the grantee.

WHAT INFORMATION IS NEEDED TO REQUEST AN AMENDMENT?
The Grantee must provide a request letter (hard or electronic copy), signed by the Grantee's authorized representative. The letter must include:

(1) The project ID # and title for which the amendment is being requested;
(2) A statement requesting an amendment;
(3) Background information explaining why the changes are needed;
(4) A list and description of the respective changes (task by task, where applicable); and
(5) A schedule for completing each proposed change (start date, any applicable milestone dates, and end date).

If deemed acceptable, approval will be received in the form of an amendment to the Agreement.

WHEN SHOULD AN AMENDMENT REQUEST BE SUBMITTED?
Amendment requests should be submitted as soon as possible after the need is determined but no closer than **90 days** from the date the Agreement is scheduled to expire. This is to allow sufficient time for planning, review, and processing of the request.

HOW MUCH TIME DOES IT TAKE TO PROCESS AN AMENDMENT?
The time needed to review and approve Grantee's amendment request varies. Provided the information submitted is clear and thorough, an amendment request typically takes about 8 to 10 weeks to process.

Attachment C
Closeout of Agreement Letter - Example

September 7, 2005

XYZ, Inc.
16 Connecticut Road
Manchester, CT 06040
Att: Jasper Link, P.E.

RE: Final Project Report
NPS Project #05-22, " Storm-water Best Management Practices Project"

Dear Eric:

Congratulations for the successful completion of your project titled "Storm-water Best Management Practices Project".

This letter acknowledges receipt of the Final Project Report dated April 12, 2005. Review of the report and project file shows that the project has been completed and the deliverables required in the Agreement have been received and accepted

If your project included a Best Management Practice (BMP), it is your responsibility to maintain the BMP in accordance with your Operation and Maintenance plan.

Thank you for your participation in the 319 Nonpoint Source program.

Sincerely,

Stanley J. Zaremba, Jr.
Environmental Analyst 3

Attachment D
Example of Work Plan

PROJECT TITLE/BRIEF SUMMARY/DETAILED DESCRIPTION/BASIN LOCATION – Descriptive name and location of the proposed project.

PROJECT TITLE:	
BRIEF PROJECT SUMMARY: **(Keep to three or four sentences long please)**	
DETAILED PROJECT DESCRIPTION: **Include "who, what, where, when and why" of the project and the steps that will be taken to insure that it will be successfully implemented.**	Who: What: Where: When: Why: Steps for success:
PROJECT DESCRIPTION CONTINUED - Documentation: If this project will implement one or more Best Management Practices (BMPs), include information on the BMP(s) that will be used and literature reference for its selection and proper design.	**If BMP Project:** What is/are the BMP(s)? Literature Reference for selection and proper design?
DESCRIBE LOCATION: ie. town, street, site, watershed. **Note: A site map must be included with this application. A site map is not necessary if the project is non-site specific or statewide.**	
MAJOR BASIN:	
PRIMARY REGIONAL BASIN # & NAME:	

SPONSOR INFORMATION – This is the Agency DEP will be contracting with /RESPONSIBLE FOR IMPLEMENTATION OF THE PROJECT – This person will be considered the project manager (if applicable fill in co-manager section.

SPONSOR NAME/MAILING ADDRESS/FISCAL OR ADMINISTRATIVE CONTACT/FEDERAL TAX ID NUMBER:	

PROJECT MGR. NAME/TITLE:			
AFFILLIATION:			
STREET ADDRESS:			
CITY, STATE ZIP:			
PHONE NUMBER and FAX:	( ) ( )	**Email address**	
PROJECT MGR. NAME/TITLE:			
AFFILLIATION:			
STREET ADDRESS:			
CITY, STATE ZIP:			
PHONE NUMBER and FAX:	( ) ( )	**Email address**	

ENVIRONMENTAL BENEFIT AND CAUSE OF IMPAIRMENT

ENVIRONMENTAL BENEFITS OF PROJECT: **Choose ONLY one of the following that best characterizes the environmental benefit most likely resulting if the proposed project is implemented successfully**	Eliminate an identified impairment throughout a watershed? ☐ Restore impaired waters or segments of impaired waters? ☐ Reduce NPS pollution but may or may not eliminate impairments? ☐ Protect stream or prevent NPS pollution? ☐ Other: Specify
CAUSES OF IMPAIRMENT ADDRESSED: **Choose ONLY one of the following that best characterizes the source of impairment that will be most directly addressed if the proposed project is successfully implemented.**	Targets impairments caused by hydromodification and resulting in silt or sediment. ☐ Targets NPS impairments caused by agricultural drainage and/or runoff and resulting nutrients, silt or sediment. ☐ Targets impairments caused by urban NPS sources ☐ Targets impairments caused by other NPS sources (specify)

ESTIMATED TOTAL COST AND NONFEDERAL SOURCES – Identify the amount of §319 funds requested (60%); nonfederal match (40%); and total cost of project (100%).

To calculate the amounts use the following **:**

Section 319 funds requested divided by .6 = Total cost

Total cost – Section 319 funds requested = 40% nonfederal match

60% -§ 319 FUNDS REQUESTED:	
40% - NONFEDERAL MATCH:	
100% TOTAL COST:	

PREVIOUS 319 FUNDING AWARDED TO GROUP? If yes, indicate below project name and fiscal year, award amount, and balance to date.

☐ **YES**	**NAME OF PROJECT:**					
	EXPECTED COMPLETION DATE:					
	$ AMT AWARDED:					
	$ BALANCE TO DATE:					
☐ **NO**	**§319 FUNDS HAVE NOT BEEN PREVIOUSLY AWARDED TO APPLICANT.**					

NOTE TO THOSE APPLICANTS PROPOSING IMPLEMENTATION OR RESTORATION ACTIVITIES:

According to federal guidelines, a watershed-based plan must be developed for the water body in question before implementation activities can be funded by § 319 funds. You will need to provide the following information in order to satisfy that requirement, consistent with guidance at: http://www.epa.gov/fedrgstr/EPA-WATER/2003/October?Day-23/w26755.htm

Please consult with DEP as to the level of commitment required to develop the watershed-based plan before implementation/restoration activities can begin.

IMPAIRMENT	**Identify causes and sources of nonpoint source impairment(s).**
LOAD REDUCTION	**Estimate expected load reductions and whether the impairment is fully addressed.**
MANAGEMENT MEASURES	**Describe the specific nonpoint source management measures to be applied.**
TECH ASSISTANCE & FINANCIAL ASSISTANCE	**Estimate needed technical and financial assistance by activity.**
PUBLIC INFORMATION & EDUCATION	**Describe public information and education efforts and their value to the project.**
MANAGEMENT MEASURES	**Provide an implementation schedule for NPS management measures.**
MILESTONES	**List the measurable milestones consistent with the implementation schedule.**
PERFORMANCE	**Provide a list of performance criteria that will be used to measure success.**
MONITORING	**Discuss how you plan on monitoring your project.**

CONSTRUCTION PROJECT/LONG TERM MAINTENANCE

If the project includes construction who is responsible for long-term maintenance?

INTERAGENCY COORDINATION, ROLES, AND RESPONSIBILITIES – Describe participation and commitments expected from other agencies and organizations.

MONITORING/QUALITY ASSURANCE QUALITY CONTROL – Will this project require a quality assurance quality control plan (QAPP).

☐ YES ☐ NO

If yes answer the following:

Will water chemistry monitoring be conducted with this project? ☐ YES ☐ NO

Will biological monitoring be conducted with this project? ☐ YES ☐ NO

Will habitat assessment monitoring be conducted with this project? ☐ YES ☐ NO

If your proposed project involves the collection, analysis, or manipulation of environmental data and it is selected for funding, it will require a Quality Assurance Project Plan (QAPP). The QAPP must be approved by CT DEP/US EPA prior to the commencement of this work. Investigators need to include the preparation and implementation of this plan into their budget **All QAPP's should be written according to one of the following guidance documents :** http://www.epa.gov/quality/qapps.html

- **EPA Requirements for Quality Assurance Project Plans EPA QA/R-5, EPA/240/B-01/003, March, 2001**

guidance documents, and will be determined on a case-by-case basis.

Also note:

1. The use of "secondary data" to make environmental decisions requires a QAPP. Secondary data are previously collected data (which may have been collected by other entities, not just the current grantee). A good example is the use of previously collected data in a computerized model to develop new data, e.g., about estimated pollutant levels. This might fall under your "manipulation" criterion.
2. If project proponent provides "in kind" services, such as sample analysis or sample collection, instead of money, a QAPP is necessary.
3. If the project is conducted with the deliberate intent to provide the data to EPA for its use, a QAPP should be written.

PERMITS – Are permits needed to complete this project? If so, please list individually, indicating which permits are needed, whether they are local, state, or federal, and if these permits have been secured. Also, who is responsible for acquiring the permits?

☐ YES ☐ NO

Permit(s):

Person(s) Responsible:

TASKS, DELIVERABLE, ESTIMATED COST – List in sequence the major tasks, deliverables, and costs. A final project report is a required deliverable for every project identify, as appropriated, any contracts to be awarded or Quality Assurance Project Plan (QAPP) plans as tasks. Any type of data analysis or data reporting will require a QAPP.

Task #	Description of Task & Deliverable	Cost § 319 funds

Estimated duration (How many months do you expect project to run - up to 2 year duration):

PUBLIC PARTICIPATION – Describe how this will be accomplished.

FY2006 ESTIMATED BUDGET SHEET

Are §319 funds being used for salaries?	☐ YES – fill out §319 salary section. ☐ NO - skip to Match salary section.

§319 SALARY INFORMATION:

NAME	TITLE	ANNUAL SALARY	APPROX. % OF TIME	SALARY CHARGED TO PROJECT	% OF FRINGE	TOTAL

STATE/LOCAL/OTHER MATCH SALARY INFORMATION:*

NAME	TITLE	ANNUAL SALARY	APPROX. % OF TIME	SALARY CHARGED TO PROJECT	% OF FRINGE	TOTAL

		Total Project Costs 100%	§319 Costs 60%	State/local/ other Match 40%
Salary & Fringe	Includes salaries and fringe benefits paid for work performed on the project. "Salary" should reflect the rate per hour, by position. An employment benefit given in addition to one's wages or salary.			
Indirect Cost of Salary	Indicate the indirect costs. Typical indirect costs are associated with but are not limited to office space, telephones, personnel administration, accounting, and room or equipment rental and usage (i.e., the cost of doing business).			
Supplies	Includes office/field/lab supplies, data processing materials, books, paper and other office supplies, clothing, Include equipment costing less than $1,000 in total.			
Equipment	Includes a single item of equipment costing more than $1,000 in total. **(unit cost > $1,000 must be itemized below) ***			
Travel and Training	Includes project-related charges for travel activities (travel, tolls), and charges as a result of use of an auto. Vehicle costs should be shown as the number of miles times the mileage rate being applied. Mileage rates (cost/mile) cannot exceed the rate approved by the Connecticut State Department of Administrative Services rates for in-state travel.			
Contractual	Includes expenditures made to sub-grantees/sub-contractors, hired speakers, legal services, cost of engineering and design, etc. The rate of pay per hour, number of hours and type of service provided should be included. Any procured services not provided by the Sponsor should be listed here.			
Construction	Costs (construction contracts, cost share agreements, etc.) associated with construction. Permit fees can be included.			
Other (specify)	Includes postage, printing, license fees, equipment maintenance and repair, computer software, non-staff insurance. **(unit cost > $1,000 must be itemized below) ***			
Totals				

* List equipment > $1,000:	
* List other expenses:	

* If needed, the applicant may wish to investigate a possible method to assign an in-kind match for volunteer work performed. See: Independent Sector calculation http://www.independentsector.org/programs/research/volunteer_time.html

PERSONAL SERVICE AGREEMENT / GRANT / CONTRACT

Rev. 12/12/05 (DEP Electronic Format)

Attachment E

(Enter Title of the Agreement)

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION

CHECK ONE:
☒ GRANT
☐ PERSONAL SERVICE AGREEMENT

1. THE STATE AGENCY AND THE CONTRACTOR AS LISTED BELOW HEREBY ENTER INTO AN AGREEMENT SUBJECT TO THE TERMS AND CONDITIONS STATED HEREIN AND/OR ATTACHED HERETO AND SUBJECT TO THE PROVISIONS OF SECTION 4-98 OF THE CONNECTICUT GENERAL STATUTES AS APPLICABLE.
2. ACCEPTANCE OF THIS CONTRACT IMPLIES CONFORMANCE WITH TERMS AND CONDITIONS STATED ON THE REVERSE SIDE OF THIS SHEET.

(1) ☒ ORIGINAL ☐ AMENDMENT	(2) IDENTIFICATION NO. P.S.

CONTRACTOR

(3) CONTRACTOR NAME	(4) ARE YOU PRESENTLY A STATE EMPLOYEE? ☐ YES ☒ NO
CONTRACTOR ADDRESS	CONTRACTOR FEIN/SSN

STATE AGENCY

(5) AGENCY NAME AND ADDRESS	(6) AGENCY NO.
DEP - _____, 79 Elm Street, Hartford, CT 06106-5127	

CONTRACT PERIOD

(7) DATE (*FROM*)	THROUGH (*TO*)	(8) INDICATE ☐ MASTER AGREEMENT ☐ CONTRACT AWARD NO. _____ ☒ NEITHER

CANCELLATION CLAUSE

This agreement shall remain in full force and effect for the entire term of the contract period stated unless cancelled by the State Agency giving the Contractor written notice of such intention (required days notice specified at right). State Agency reserves the right to recoup any deposits, prior payment, advance payment or down-payment made if the contract is terminated by either party. DEP reserves the right to cancel the contract without prior notice when the funding for the contract is no longer available, or for contractor performance.

(9) REQUIRED # OF DAYS WRITTEN NOTICE 30

COMPLETE DESCRIPTION OF SERVICE

(10) CONTRACTOR AGREES TO: (Include special provisions - Attach additional blank sheets if necessary.)

1. Performance: Do, conduct, perform or cause to be performed in a satisfactory and proper manner as determined by the Commissioner of Environmental Protection, all work described in Appendix A, which is attached hereto and made a part hereof.
   Appendix A consists of ____ pages numbered A-1 through A-_____ inclusive.

Continued on Page 3 of 4, which is attached hereto and made a part hereof.
Page 1 of 4
(Page 2 of 4 is the reverse side of this sheet)

COST AND SCHEDULE OF PAYMENTS

(11)PAYMENT TO BE MADE UNDER THE FOLLOWING SCHEDULE UPON RECEIPT OF PROPERLY EXECUTED AND APPROVED INVOICES.

Cost and Schedule of Payments is attached hereto as Appendix B, and made a part hereof. (Appendix B consists of ____ page(s) numbered B-1 through B-__).

Total Payments Not to Exceed the Maximum Amount of $_____.

(12) ACT CD	(13)DOC TYP	(14) COM. TYP	(15) LSE. TYP	(16) ORIG. AGCY	(17) DOCUMENT NO.	(18) COMMIT. AGCY	(19) COMMIT. #

(20) COMMITTED AMOUNT	(21) OBLIGATED AMOUNT

(22) Amount	(23) Dept	(24) Fund	(25) SID	(26) Program	(27) Project	(28) Bud Ref	(29) Agency CF 1	(30) Agency CF 2	(31) Account

An individual entering into a Personal Service Agreement with the State of Connecticut is contracting under a "work-for-hire" arrangement. As such, the individual is an independent contractor, and does not satisfy the characteristics of an employee under the common law rules for determining the employer/employee relationship of Internal Revenue Code section 3121(d). Individuals performing services as independent contractors are not employees of the State of Connecticut and are responsible themselves for payment of all State and local income taxes, federal income taxes and Federal Insurance Contribution Act (FICA) taxes.

ACCEPTANCES AND APPROVALS	(32) **STATUTORY AUTHORITY** CGS Sec. 22a-6(a)(2) as amended and 33 USC Sec. 1329	
(33) CONTRACTOR (OWNER OR AUTHORIZED SIGNATURE)	TITLE	DATE
(34) AGENCY (AUTHORIZED OFFICIAL)	TITLE Deputy Commissioner	DATE
(35) ATTORNEY GENERAL (APPROVED AS TO FORM)		DATE

DISTRIBUTION: CONTRACTOR AGENCY FUNDS AVAILABLE:_____ DATE:_____

TERMS / CONDITIONS

EXECUTIVE ORDERS

Executive Order No. Three: This contract is subject to the provisions of Executive Order No. Three of Governor Thomas J. Meskill promulgated June 16, 1971 and, as such, this contract may be canceled, terminated or suspended by the State Labor Commission for violation of or noncompliance with said Executive Order No. Three, or any state or federal law concerning nondiscrimination, notwithstanding that the Labor Commissioner is not a party to this contract. The parties to this contract, as part of the consideration hereof, agree that said Executive Order No. Three is incorporated herein by reference and made a part hereof. The parties agree to abide by said Executive Order and agree that the State Labor Commissioner shall have continuing jurisdiction in respect to contract performance in regard to nondiscrimination, until the contract is completed or terminated prior to completion. The contractor agrees, as part consideration hereof, that this contract is subject to the Guidelines and Rules issued by the State Labor Commissioner to implement Executive Order No. Three and that he will not discriminate in his employment practices or policies, will file all reports as required, and will fully cooperate with the State of Connecticut and the State Labor Commissioner.

Executive Order No. Sixteen: This Agreement is subject to Executive Order No. Sixteen of Governor John G. Rowland promulgated August 4, 1999 regarding a policy of prevention of violence in the workplace.

Executive Order No. Seventeen: This contract is subject to the provisions of Executive Order No. Seventeen of Governor Thomas J. Meskill promulgated February 15, 1973 and, as such, this contract may be canceled, terminated or suspended by the contracting agency or the State Labor Commissioner for violation or of noncompliance with said Executive Order No. Seventeen, notwithstanding that the Labor Commissioner may not be a party to this contract. The parties to this contract, as part of the consideration hereof, agree that Executive Order No. Seventeen, concerning job listings with the State Employment Service, is incorporated herein by reference and made a part hereof. The parties agree to abide by said Executive Order and agree that the contracting agency and the State Labor Commissioner shall have joint and several continuing jurisdiction in respect to contract performance in regard to listing all employment openings with the Connecticut State Employment Service.

Executive Order No. 7B: This Agreement incorporates the provisions of Executive Order No. 7B of Governor M. Jodi Rell, promulgated November 16, 2005 regarding contracting reforms.

NON-DISCRIMINATION (taken from CGS)

A. The following subsections are set forth here as required by section 4a-60 of the Connecticut General Statutes:

(1) The contractor agrees and warrants that in the performance of the contract such contractor will not discriminate or permit discrimination against any person or group of persons on the grounds of race, color, religious creed, age, marital status, national origin, ancestry, sex, mental retardation or physical disability, including, but not limited to, blindness, unless it is shown by such contractor that such disability prevents performance of the work involved, in any manner prohibited by the laws of the United States or of the state of Connecticut. The contractor further agrees to take affirmative action to insure that applicants with job-related qualifications are employed and that employees are treated when employed without regard to their race, color, religious creed, age, marital status, national origin, ancestry, sex, mental retardation, or physical disability, including, but not limited to, blindness, unless it is shown by such contractor that such disability prevents performance of the work involved; (2) the contractor agrees, in all solicitations or advertisements for employees placed by or on behalf of the contractor, to state that it is an "affirmative action-equal opportunity employer" in accordance with regulations adopted by the commission; (3) the contractor agrees to provide each labor union or representative of workers with which such contractor has a collective bargaining agreement or other contract or understanding and each vendor with which such contractor has a contract or understanding, a notice to be provided by the commission advising the labor union or workers' representative of the contractor's commitments under this section, and to post copies of the notice in conspicuous places available to employees and applicants for employment; (4) the contractor agrees to comply with each provision of this section and sections 46a-68e and 46a-68f and with each regulation or relevant order issued by said commission pursuant to sections 46a-56, 46a-68e and 46a-68f; (5) the contractor agrees to provide the Commission on Human Rights and Opportunities with such information requested by the commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the contractor as relate to the provisions of this section and section 46a-56.

B. If the contract is a public works contract, the contractor agrees and warrants that he will make good faith efforts to employ minority business enterprises as subcontractors and suppliers of materials on such public works project.

C. "Minority business enterprise" means any small contractor or supplier of materials fifty-one per cent or more of the capital stock, if any, or assets of which is owned by a person or persons: (1) Who are active in the daily affairs of the enterprise, (2) who have the power to direct the management and policies of the enterprise and (3) who are members of a minority, as such term is defined in subsection (a) of section 32-9n; and "good faith" means that degree of diligence which a reasonable person would exercise in the performance of legal duties and obligations. "Good faith efforts" shall include, but not be limited to, those reasonable initial efforts necessary to comply with statutory or regulatory requirements and additional or substituted efforts when it is determined that such initial efforts will not be sufficient to comply with such requirements.

D. Determination of the contractor's good faith efforts shall include but shall not be limited to the following factors: The contractor's employment and subcontracting policies, patterns and practices; affirmative advertising, recruitment and training; technical assistance activities and such other reasonable activities or efforts as the commission may prescribe that are designed to ensure the participation of minority business enterprises in public works projects.

E. The contractor shall develop and maintain adequate documentation, in a manner prescribed by the commission, of its good faith efforts.

F. The contractor shall include the provisions of section A above in every subcontract or purchase order entered into in order to fulfill any obligation of a contract with the state and such provisions shall be binding on a subcontractor, vendor or manufacturer unless exempted by regulations or orders of the commission. The contractor shall take such action with respect to any such subcontract or purchase order as the commission may direct as a means of enforcing such provisions including sanctions for noncompliance in accordance with section 46a-56; provided, if such contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the commission, the contractor may request the state of Connecticut to enter into any such litigation or negotiation prior thereto to protect the interests of the state and the state may so enter.

G. The following subsections are set forth here as required by section 4a-60a of the Connecticut General Statutes:
(1) The contractor agrees and warrants that in the performance of the contract such contractor will not discriminate or permit discrimination against any person or group of persons on the grounds of sexual orientation, in any manner prohibited by the laws of the United States or of the state of Connecticut, and that employees are treated when employed without regard to their sexual orientation; (2) the contractor agrees to provide each labor union or representative of workers with which such contractor has a collective bargaining agreement or other contract or understanding and each vendor with which such contractor has a contract or understanding, a notice to be provided by the Commission on Human Rights and Opportunities advising the labor union or workers' representative of the contractor's commitments under this section, and to post copies of the notice in conspicuous places available to employees and applicants for employment; (3) the contractor agrees to comply with each provision of this section and with each regulation or relevant order issued by said commission pursuant to section 46a-56; (4) the contractor agrees to provide the Commission on Human Rights and Opportunities with such information requested by the commission, and permit access to pertinent books, records and accounts, concerning the employment practices and procedures of the contractor which relate to the provisions of this section and section 46a-56.

H. The contractor shall include the provisions of section G above in every subcontract or purchase order entered into in order to fulfill any obligation of a contract with the state and such provisions shall be binding on a subcontractor, vendor or manufacturer unless exempted by regulations or orders of the commission. The contractor shall take such action with respect to any such subcontract or purchase order as the commission may direct as a means of enforcing such provisions including sanctions for noncompliance in accordance with section 46a-56; provided, if such contractor becomes involved in, or is threatened with, litigation with a subcontractor or vendor as a result of such direction by the commission, the contractor may request the state of Connecticut to enter into any such litigation or negotiation prior thereto to protect the interests of the state and the state may so enter.

INSURANCE

The contractor shall carry insurance during the term of this contract according to the nature of the work to be performed to "save harmless" the State of Connecticut from any claims, suits or demands that may be asserted against it by reason of any act or omission of the contractor, subcontractor or employees of either the contractor or subcontractor in providing services of this contract. Certificates of such insurance shall be filed with the state agency prior to the contractor's performance of contracted service.

STATE LIABILITY

The State of Connecticut shall assume no liability for payment for services under the terms of this agreement until the contractor is notified that this agreement has been accepted by the contracting agency and, if applicable, approved by the Office of Policy and Management (OPM) or the Department of Administrative Services (DAS) and by the Attorney General of the State of Connecticut..

2. **Commissioner.** For the purposes of this contract, "Commissioner" means the Commissioner of Environmental Protection or the Commissioner's designee. All correspondence submitted in accordance with this contract shall be submitted to: Stanley Zaremba, Nonpoint Source Program Coordinator (NPS Program Coordinator), Department of Environmental Protection (DEP) – Bureau of Water Management – Planning & Standards Division, 79 Elm Street, Hartford, CT 06106-5127.

3. **Acknowledgement of Funding.** Any publication or sign produced or distributed or any publicity, i.e. news release, workshop announcement, etc. conducted in association with this contract shall provide credit to the US Environmental Protection Agency (EPA) and CT Department of Environmental Protection (DEP) as follows: "Funded in part by the Connecticut Department of Environmental Protection through a United States Environmental Protection Agency Clean Water Act Section 319 Nonpoint Source Grant."

4. **Distribution of Materials.** The Contractor must obtain written approval from NPS Program Coordinator prior to distribution or publication of any printed material prepared under the terms of this contract. Such approval shall not be unreasonably withheld.

5. **Change in Scope of Work.** Any proposed change in the Scope of Work included in Appendix A must be requested in writing to the NPS Program Coordinator and, if acceptable, authorized through a contract amendment. Changes in the Scope of Work may not be made in any other way.

6. **Change in Principal Project Staff.** Any changes in the principal project staff must be requested in writing and approved in writing by the NPS Program Coordinator. In the event of any unapproved change in principal project staff, the Commissioner may, in his sole discretion, terminate or cancel this contract.

7. **Recording and Documentation of Receipts and Expenditures.** Accounting procedures must provide for accurate and timely recording of receipt of funds by source, expenditures made from such funds, and of unexpended balances. Controls must be established which are adequate to ensure that expenditures under this agreement are for allowable purposes and that documentation is readily available to verify that such charges are accurate.

8. **Assignability.** The Contractor shall not assign any interest in this contract, and shall not transfer any interest in the same (whether by assignment or novation), without the prior written consent of the Commissioner thereto: provided, however, that claims for money due or to become due the Contractor from the Commissioner under this contract may be assigned to a bank, trust company, or other financial institution without such approval. Notice of any such assignment or transfer shall be furnished promptly to the Commissioner.

9. **Officials Not to Benefit.** No member of or delegates to the Congress of the United States of America, no resident Commissioner, and no elected or appointed municipal official shall be admitted to any share or part hereof or to any benefit to arise herefrom.

10. **Severability**. The provisions of this Contract are severable. If any part of it is found unenforceable, all other provisions shall remain fully valid and enforceable, unless the unenforceable provision is an essential element of the bargain.

11. **Choice of Law.** This Contract shall be governed by the substantive laws of the State of Connecticut.

12. **Third Party Participation.** The Contractor may make sub-awards to conduct any of the tasks in the Scope of Work contained in Appendix A. The Contractor shall advise the NPS Program Coordinator of the proposed sub-awardee and the amount allocated at least 2 weeks prior to the making of such awards. The Commissioner reserves the right to disapprove such awards if they appear to be inconsistent with the program activities to be conducted under this grant.

13. **Procurement of Materials and Supplies.** The Contractor and any subcontractors shall follow the Federal Procedures for purchases and contracts required pursuant to Federal (EPA) Regulations 40 CFR Part 31.36.

14. **Definition of "Execution.** This contract shall be fully executed when it has been signed by authorized representatives of the parties, and if exceeding $3,000.00, by the authorized representative of the state Attorney General's office."

15. **State Audit.** The Grantee receiving federal funds must comply with the federal Single Audit Act of 1984, P.L. 98-502 and the Amendments of 1996, P.L. 104-156. The Grantee receiving state funds must comply with the Connecticut General Statutes Section 7-396a and 396b, and the State Single Audit Act Sections 4-230 through 4-236 inclusive, and Regulations promulgated thereunder. The Grantee agrees that all fiscal records pertaining to the project shall be maintained for a period of not less than three (3) years from the date the project is completed. Such records will be made available to the state and/or federal auditors upon request.

16. **Litigation.** The Contractor agrees that the sole and exclusive means for the presentation of any claim against the State arising from this contract shall be in accordance with Chapter 53 of the Connecticut General Statutes (Claims Against

the State) and the Contractor further agrees not to initiate legal proceedings in any State or Federal Court in addition to, or in lieu of, said Chapter 53 proceedings.

17. **Cancellation.** This agreement shall remain in full force and effect for the entire term of the contract period stated unless cancelled by DEP giving the Contractor written notice of such intention at least 30 days in advance. DEP reserves the right to recoup any deposits, prior payment, advance payment or down-payment made if the contract is terminated by either party. DEP reserves the right to cancel the contract without prior notice when the funding for the contract is no longer available.

18. **Administrative Costs Funded by Section 319 Funds may not exceed 10% of the contract.** Pursuant to section 319(h)(12), administrative costs in the form of salaries, overhead, or indirect costs for services provided and charged against activities and programs carried out with the grant shall not exceed 10 percent of the contract. The costs of implementing enforcement and regulatory activities, education, training, technical assistance, demonstration projects, and technology transfer are not subject to this limitation.

19. **Consultant Costs.** EPA participation in the salary rate (excluding overhead) paid to individual consultants is limited to the maximum daily rate for a Level IV of the Executive Schedule, adjusted annually. This limit applies to consultation services of designated individuals with specialized skills who are paid at a daily or hourly rate current $523.87 daily, $65.48 hourly (January 1, 2004) rate.

20. **Copyright.** All materials produced under this contract become the property of the DEP, and the Contractor agrees that all rights including copyrights for text, formatting and illustration created or used for this project shall be assigned to the DEP. The Contractor agrees to obtain copyright permission for any materials used in this project that has been copyrighted by others.

21. **Hotel and Motel Fire Safety Act.** The Contractor agrees to ensure that all requisitions for conference, meeting, convention, or training space funded in whole or in part with federal funds complies with the Hotel and Motel Fire Safety Act of 1990.

22. **Minority.** The Contractor agrees that at least 8.5% of the contract amount will be sub-contracted for services by minority business enterprises or sub-contractor for services by minority business enterprises or women's business enterprises. The Contractor will document attempts to follow affirmative action steps outlines under 40 CRF Part 33.240 to assure small, minority and women's business participation when possible.

23. **Monitoring Data.** All monitoring data shall be submitted to DEP (Michael.Beauchene@po.state.ct.us) and (Stanley.Zaremba@po.state.ct.us) in electronic and hard copy format according to the Scope of Work in this contract. Electronic data format shall be determined during the Quality Assurance Project Plan (QAPP) approval process.

24. **Non-federal Match Documentation.** The Contractor is responsible for ensuring that records are maintained which adequately document the valuation of non-federal match/in-kind services, and submit a summary to DEP. Non-federal match/in-kind services must come from sources other than federal.

25. **Permits.** It is the sole responsibility of Contractor to obtain all necessary permits.

26. **Entertainment Costs.** In accordance with Circular A-122 (non-profits) and A-87 (State, Local, and Indian Tribal Governments) the cost of amusement, diversion, social activities, ceremonials, and costs relating thereto, such as meals, lodging, rentals, transportation, gratuities and alcoholic beverages are not allowable expenses.

27. **Program Income.** Projects shall not be designed to generate program income from the CWA Section 319 Nonpoint Source Program. Special exceptions may be made at the sole discretion of the Commissioner.

28. **Recycle.** Whenever possible, project publications should be printed on recycled content (preferable 20% or more post-consumer), ground-wood free, white or off-white paper stock.

29. (Delete if not Appl) **Operation & Maintenance.** Any management practices implemented must be properly operated and maintained for a 5 year period. Operation includes the administration, management, and performance of non-maintenance actions needed to keep the completed practice safe and functioning as intended. Maintenance includes work to prevent deterioration of the practice, repairing damage, or replacement of the practice to its original condition if one or more components fail. DEP may periodically inspect a practice to ensure that operation and maintenance are occurring. If it is determined that participants are not operating and maintaining practices in an appropriate manner, DEP will request a refund for that practice supported by the grant.

APPENDIX A
SCOPE OF WORK

Project
Title of Agreement

Purpose: Clean Water Act Section 319h Nonpoint Source grant awards provide funds to the Connecticut Department of Environmental Protection to support state activities for abating or preventing nonpoint source pollution.

Description: The Contractor agrees to conduct a project entitled: **Title of Agreement.**

1. **Summary and Tasks**: Summary of the project.

   a. **Task 1 title** .

   b. **Task 2 title**.

   c. **Task 3 title**.

   d. **Task 4 title**.

   e. **Task 5 title**.

   f. **Task 6 title**.

   g. **Task 7 title**.

   h. **Task 8 title**.

2. **Project Summaries /Final Report**:

- **Quarterly Reports:** The Contractor shall use the format in **Appendix C.** Following the execution of this contract, the Contractor is responsible for providing summaries of the project status to the NPS Program Coordinator once **every 3 months** according to the schedule in Appendix C during the time in which this contract is in effect. The Contractor bears the sole responsibility for submitting the Quarterly Report on time.

- **Final Reports:** Within 60 days following the expiration date of this contract, the Contractor shall submit to the NPS Program Coordinator the following:

  - **Final Report:** The Contractor shall use the attached format in **Appendix D**.
  - **Non-federal Match Documentation:** The Contractor is responsible for ensuring that records are maintained which adequately document the valuation of non-federal match/in-kind services, and submit a summary to DEP. Non-federal match/in-kind services must come from any source other than federal. The Contractor shall use the attached form in **Appendix E**.
  - **Grants Reporting and Tracking System (GRTS):** The Contractor shall submit a GRTS Form, which will update the Federal 319 Grant Reporting requirements as mandated by US

EPA. environmental data operations conducted in EPA-New England. To access document, please refer to the following website: http://www.dep.state.ct.us/wtr/nps/grts.doc.

- **NPS Site Report:** DEP requires completion of a NPS Site Report when grant funds are used to pay for construction costs at a NPS Site. The Contractor shall use the attached form in **Appendix G**.
- ***(If applicable)*** **Operation and Maintenance Plan:** The Contractor shall submit an Operation and Maintenance Plan. (See paragraph #8 below.)

3. **Request for Payments:** The Contractor shall submit invoices (use the attached format in **Appendix F**). These invoices must be submitted to the NPS Program Coordinator and include all required documentation to enable a timely review by the NPS Program Coordinator. DEP will release payments following receipt, review, and approval by the Commissioner of properly executed invoices. Partial payments may be requested in writing by the Contractor and include documentation as to why a partial payment is warranted but release of such payments is at the sole discretion of the NPS Program Coordinator. DEP may withhold payments if Contractor does not exhibit adequate compliance and performance according to terms of the Contract Agreement.

4. **Submission of Materials:** For the purposes of this contract, all correspondence, summaries, reports, products and extension requests shall be submitted to:

Connecticut Department of Environmental Protection
Stan Zaremba, NPS Program Coordinator
Bureau of Water Management
Planning and Standards Division
79 Elm Street
Hartford, CT 06106-5127

5. **Amendments/Extensions:** Formal written amendment of the contract is required for extensions to the final date of the contract period and to terms and conditions specifically stated in the original contract and any prior amendments, including but not limited to:

- Revisions to the maximum contract payment;
- The total unit cost of service;
- The contract's objectives, services, or plan;
- Due dates for reports;
- Completion of objectives or services; and
- Any other contract revisions determined material by DEP.

If it is anticipated that the project cannot be completed as scheduled, a no-cost extension must be requested in writing no later than **90 days** prior to the expiration date of the contract. Said extension request shall include a description of what work has been completed to date, shall document the reason for the extension request, and shall include a revised work schedule and project completion date. If deemed acceptable, approval will be received in the form of a contract amendment.

6. *(Delete if not applicable)* **Quality Assurance Project Plan (QAPP) or Modeling Plan:** A Quality Assurance Project Plan documents the planning, implementation, and assessment procedures for a particular project, as well as any specific quality assurance and quality control activities. It integrates all the technical and quality aspects of the project in order to provide a "blueprint" for obtaining the type and quality of environmental data and information needed for a specific decision or use. All work performed or funded by EPA that involves the acquisition of environmental data must have an

approved QAPP. CT DEP and EPA must review all QAPPs prior to the commencement of any monitoring component of the project. All QAPPs shall be written in conformance with EPA guidance. Referenced below are selected EPA requirements and/or guidance for QAPPs:

- **EPA Requirements for QAPPs (QA/R-5)**, March 2001, EPA/240/B-01/003. Defines specifications for QAPPs prepared for activities conduced by or funded by EPA.

- **Guidance for QAPPs (G-5)**, December 2002, EPA/240/R-02/009. Guidance on developing QAPPs that meet EPA specifications.

- **Guidance for QAPP for Modeling (G-5M)**, December 2002, EPA/240/R-02/007. Guidance on developing QAPPs for modeling projects.

- **Guidance on QAPPs for secondary Research Data,** July 1999. Example guidance by the QA managers in EPA's National Risk Management Research Laboratory.

- EPA New England **Compendium of QAPP Requirements and Guidance**, 1999. Compendium provides the framework for all project-specific and generic program QAPPs prepared for environmental data operations conducted in EPA-New England.

To access these and other quality assurance documents, please refer to the following website: http://www.epa.gov/quality/qapps.html.

7. *(Delete if not applicable)* **Native Plants:** Projects involving riparian/habitat restoration should utilize native plants and avoid planting trees and shrubs that are considered invasive. Planting materials for habitat restoration projects should be selected from the Connecticut Native Tree Shrub and Availability List. See the following web site for information http://www.dep.state.ct.us/burnatr/wildlife/pdf/ntvtree.pdf. Avoid planting trees and shrubs that are considered invasive by threatening the local native ecosystem. While not an all-inclusive listing, the major plants of concern include: Norway maple, sycamore maple, Japanese barberry, Japanese honeysuckle, burningbush, Russian olive, rugosa rose, multifora rose, Asiatic bittersweet, porcelainberry, and purple loosestrife. Please refer to Non-Native Invasive and Potentially Invasive Vascular Plants in Connecticut revised January 2003 and Native Alternatives for Invasive Ornamental Plant Species on the Connecticut Invasive Plant Work Group website (hosted by UConn) at: http://www.hort.uconn.edu/cipwg/ .

8. *(Delete if not applicable):* Each Section 319 grant must contain a condition requiring that the State assure that any management practices implemented for the project be properly operated and maintained for the intended purposes during its life span. Operation includes the administration, management, and performance of non-maintenance actions needed to keep the completed practice safe and functioning as intended. Maintenance includes work to prevent deterioration of the practice, repairing damage, or replacement of the practice to its original condition if one or more components fail. The condition must require the State to assure that any sub-award of Section 319 funds similarly include the same condition in the sub-award. Additionally, such condition must reserve the right of EPA and the State, respectively, to periodically inspect a practice during the life span of the project to ensure that operation and maintenance are occurring, and shall state that, if it is determined that participants are not operating and maintaining practices in an appropriate manner, EPA or the State, respectively, will request a refund for that practice supported by the grant. The life span of a project will be determined on a case-by-case basis, tailored to the types of practices expected to be funded in a particular project, and should be specified in the grant condition. For assistance in determining the appropriate life span of the project, States may wish to consult with colleagues implementing similar

programs, such as USDA's conservation programs. For example, for conservation practices, it may be appropriate to construct the life span consistent with the life span for similar conservation practices as determined by the Commodity Credit Corporation (pursuant to the implementation of the Environmental Quality Incentives Program). Following the approach used in many State and Federal funding programs, practices will generally be operated and maintained for a period of at least five to ten years. A sub-awardee and the State may agree to transfer a grant to another party. The transferee must be determined by the State to be eligible to participate in the administration of the Section 319 grant and must assume full responsibility under the grant, including operation and maintenance of those practices already installed and to be installed as a condition of the grant. The State should require a participant to refund all or a portion of the grant if the participant sells or loses control of the land under the grant and the new owner or controller is not eligible to participate in the program or refuses to assume responsibility under the contract.

APPENDIX B

SCHEDULE OF PAYMENTS

Project

Title of Agreement

The maximum amount payable under this contract is spell out dollars **($0.00)**.

The payments by the Commissioner shall allow for use of funds to meet allowable financial obligations incurred in conjunction with this project, prior to expiration of this contract, and shall be scheduled as follows provided that the total sum of all payments shall not exceed the maximum contract amount noted above.

Task #	Task Title	Payment Amt.
1. a.	Title	
1. b	Title	
1. c	Title	
1. d	Title	
1. e	Title	
1. f	Title	
1. g	Title	
1. h	Title.	
2	Project Summaries (Quarterly Reports), GRTS forms, match documentation and Final Report, and Operation and Maintenance Plan.	
	Total Amount not to exceed	

The Contractor shall submit invoices (use the attached format in **Appendix F**) when requesting a payment. Payment shall be processed contingent upon receipt by the NPS Program Coordinator of detailed invoices with any required supportive documentation according to **Appendix A**, subject to review and approval by DEP.

APPENDIX C
QUARTERLY REPORT FORMAT

Project
Title of Agreement

Quarterly Reports: Following the execution of this contract, the Contractor is responsible for providing summaries of the project status to the NPS Program Coordinator once **every 3 months** according to the below schedule during the time in which this contract is in effect. The Contractor bears the sole responsibility for submitting the Quarterly Report on time.

Report on work performed during:	**Report due on:**
September 1 – November 30	December 15
December 1 – February 28 or 29	March 15
March 1 – May 31	June 15
June 1 – August 31	September 15

Quarterly reports **shall be submitted or e-mailed (preferred method) to** Stanley.Zaremba@po.state.ct.us and include and be organized according to the following:

4. Project Number and Title;
5. Task #;
6. And the following information for each task:

    c. Performance/Milestone Summary: A listing of major program and project accomplishments for the period (based on the schedule in the **Appendix A**, Scope of Work), as well as progress made toward meeting future milestones.
    d. Slippage Reports: Provide reasons for delays in meeting schedule milestones/commitments and discuss what actions (State, Federal or other) will be taken to resolve any current or anticipated problems.
    e. Additional pertinent information including, when appropriate analysis and explanation of cost overruns, unanticipated events/consequences, etc.

APPENDIX D
FINAL REPORT FORMAT

Project
Title of Agreement

Final Report: Within 60 days following the expiration date of this contract, the Contractor shall submit to the NPS Program Coordinator, a Final Report (hard copy & e-mailed and/or disk/CD [compatible with MSWord]) including documentation, satisfactory to the Commissioner, demonstrating that all the elements of Appendix A, have been met including but not limited to the following:

- **Cover sheet** with project # / project title / project manager(s) / report date;
- **Executive Summary/Abstract;**
- **Introduction;**
- **The Resource, Environmental Problems;**
- **The Solution;**
- **Project Partners and Funding;**
- **Results;**
- **Future Plans;** and
- **Conclusions** (whether the project was a success or not; problems or difficulties experienced and how resolved; how the project recipient(s) evaluated the effectiveness of the project; any recommendations for continued action; implementation/demonstration or implementation project(s) must provide slide(s)/photos of before and after implementation.)

APPENDIX E
NON FEDERAL MATCH DOCUMENTATION FORM

Non-Federal Match Documentation / Certification

Grantees need to document matching funds or services contributed to the project. The amount of match required is listed under BUDGET INFORMATION in the project work plan. Grantees must submit this form "Non-federal Match Documentation / Certification" prior to the release of the final payment.

The Grantee must certify in writing that match has been documented before closeout of the Agreement. The following information is needed to adequately document match. To efficiently meet documentation requirements, Grantees should accumulate match information as the project proceeds and record information in a table.

1. Source. Identify the source of the funds or services;
2. Activity Describe the activity and the amount of activity; and
3. Valuation Describe the basis for assigning the amount of dollar value to the activity.

Important: This signed certification form must be accompanied by supporting information that documents (source, activity and valuation) the matching funds or services claimed by the Grantee. The Certification Statement alone is not sufficient to document the non-federal match.

GRANTEE INFORMATION:

Name: _____
Address: _____
_____
_____
Telephone: ( )_____
Contact Person: _____

PROJECT INFORMATION:

Project Title: _____
Project ID# (Example…#05-22): _____ Agreement Duration _____-_____

Match Amount required under the Agreement $_____
Match Amount Claimed $_____

CERTIFICATION STATEMENT:
I certify that the non-federal match detailed in the attached information were expended in the course of completing work described in the Agreement for the Project referenced above, and that detailed documentation of the match information is on file and available for review at the Grantee address shown above.

_____ Date ____/____/____

Signature of Grantee - Authorized Official

Non-Federal Match Documentation-Example
This is an example of a sample of non-federal match at completion (closeout) of a NPS project.
Costs or in-kind contributions counting towards satisfying a matching requirement must be verifiable from the records of the Grantee.
Upon request, records must be available for the DEP and/or EPA review.

Non-Federal Match Summary **NPS Project #05-22 Action Watershed Improvement Project-Phase II**

* Date	Source	Activity or Item	Hours	Rate or Value	Subtotal	**Mileage (current rate)	Total
	John Doe	Steering committee	30	$15?hr	$450	$64	$514
	Karen Smith	Steering committee	48	$15/hr	$720	$80	$780
	Susan Roberts, Town CEO	Compliance assistance for septic systems, task 2	42	$25/hr	$1,000	$50	$1150
	Joe Roberts, Instructor	Presentation Road BMP training, task 5a	17	$30/hr	$510	$15	$858
	Victoria Morton, Attorney	Setup Riparian easement, task 4	21	$95/hr	$1,995	$12	$2,007
	Eric Rich, NWA	Produce 4 newsletters, task 6	62	$15/hr	$930	$10	$940
	XYZ Plant Nursery	Plant materials donations for 4 NPS sites		$120			$120
	Tom Eric	BMP installation, private road		$900			$900
	Tom Briter	BMP installation, residence		$200			$200
	High Bank Farm	BMP installation, heavy use area		$6,400			$6,400
	Summertown, Town of	BMP installation, Stine Road Drainage BMP's Project		$8,500			$8,500
	Summertown, Town of	BMP installation, Nice Park Riparian BMP's Project		$5000			$5,000
	Summertown, Town of	BMP installation, Long Road Drainage BMP's Project		$9000			$9,500
	Ray Charles	BMP installation, Buffer planting		$180			$180
	Action Watershed Assoc.	Cash contribution Grantee, Outcome report, task 5b					$1,000
	Albert Corperate Foundation	Grant to Grantee, used for various project activities					$2,000
						Totals	39,216

- * Date must be within the agreement period
- ** Current State of Connecticut Government rate for mileage. See http://www.gsa.gov/Portal/gsa/ep/home.do?tabId=0.

Valuation of Activities/Items
1.) General volunteer labor to help install BMPs were valued at $15/hr based on _____.
2.) Town CEO regular rate of pay exclusive of fringe and overhead.
3.) Typical billing rate for professional legal services in this area is $90-$110 per hour.
4.) Activity "BMP installations" summarize the non-federal expenses at a BMP construction site; this is the sum of materials, labor and mileage.

APPENDIX F
INVOICE / REQUEST FOR PAYMENT

319 Nonpoint Source Grants
Connecticut Department of Environmental Protection
(Shaded areas to be completed by DEP)

Recipient Name:
Address:

FEIN#:
Project Workplan I.D. Number:
Project Title:

Contract Number:_____ PO#_____

Review Date	Staff	Initials
	Bus. Off.	
	Proj. Mgr.	
	NPS Mgr.	
	Supervisor	

To Be Completed By Recipient:

Date of Invoice: _____ Invoice # _____ **Check if Final Payment**: ☐

(Each Invoice must be accompanied with the appropriate 40% Match Documentation).

Payment # _____Task # _____(***must be included on the first page of related documentation***)

Contract Amount: $_____

1.) Previous Account Balance: $_____

2.) **Amount Requested This Payment $_____ Check if Partial Payment** ☐ (Explain)
Description:_____
_____
_____.

3.) Remaining Balance following this Payment (#1 minus #2): $_____

Recipient certifies that funds were expended on allowed activities and purposes in accordance with the Contract. Recipient has submitted required documentation and agrees to produce on request further documentation and/or the source documents used to prepare this payment request. **To expedite the review and approval process, include all required documentation, which must note the task # on the first page**.

SUBMITTED BY: (Recipient Authorized Representative) _____

Name (Please print)_____ Title_____ Date_____

Amount	Account	Fund	Dept.	Program	SID	Bud Ref	Project	CF2
$0.00	55050	12060	DEP43720	61004	20871		DEP000002025	DEP

DEP Approval:_____Date_____

Planning and Standards Division, Bureau of Water Management

APPENDIX G
NPS SITE REPORT

Complete the NPS Site Report form to document Best Management Practices (BMP) installation / construction at a NPS site. DEP requires completion of a NPS Site Report when grant funds are used to pay for construction costs at a NPS site. For more information refer to the Section 11 in the NPS Grant Administrative Guidelines.

Date Submitted to DEP: _____(Submit this Report after completion of the BMP installation at a NPS site)

Project Grantee: _____

Grantee Contact Person: _____

Project ID#: _____ Project Title: _____

Location: _____

Property ownership where BMP installed: ☐ Federal ☐ State ☐ Municipal ☐ Private

☐ Was an easement required?

NPS Site Conditions Before & After BMP Implementation. Briefly describe the NPS site before and after BMP installation, ie. NPS Problem? Solution? Attach a sketch or photos depicting "before" & "after" conditions:

_____
_____
_____
_____
_____
_____.

Tech Transfer / Public Outreach. Briefly describe any action to demonstrate the value of the BMP to others:

_____
_____
_____
_____
_____
_____.

Operation and Maintenance Plan. Briefly summarize (or attach documentation) to indicate who will be responsible and how the BMPs at the NPS Project site will be inspected and maintained:

_____
_____
_____
_____
_____
_____.

Attachment 4 CT DEP's Form for EPA's Mandated Elements for GRTS

Select appropriate field to enter data – type value or choose appropriate default value. All completed material shall be submitted by e-mail to Stanley.zaremba@po.state.ct.us or mail to: Stanley Zaremba, DEP/Water Management, 79 Elm Street, Hartford, CT 06106-5127.

*Denotes EPA mandated items.

This shaded section will be filled out by DEP Grant Number_____Fiscal Year_____

Project Header Information

GRTS Project number: (example Project #1)

State project number: (example Project #05-01)

Project Title: (example NPS Implementation)*

Project Description*

Background/Overview of the Project *– **Provide a short summary of the history or background of the project. Denote how the pollutants are impacting the receiving waters; is this particular stream reach(es) identified in the state's nonpoint annual plan; the priority which the particular waterbody holds within the state's plan; the method to monitor or model the BMPs performance; and a narrative).**
Objectives and Goals of Project *– **What are the anticipated benefits and goals of the project and how do they relate to the states water quality plan. A. Expected outcome: anticipated project success B. Output: project practices initiated, videos, workshops, field days, reports, etc.)**
Methods Employed* **-Describe the approach selected to address/correct the problem(s) (e.g. Educational program types of BMPs installed, and the anticipated life of the BMPs)**

Budget*

The number of State full time employees (FTE's) funded under this grant (for DEP projects only)*	
319(h) Base Funds:*	
319(h) Incremental Funds:*	
Total 319 (h) Funds*	

For additional information:

Contact Person: Stanley Zaremba, 319 Project Coordinator
Address: DEP/Water Management
79 Elm Street
Hartford, CT 06106-5127
e-mail: **Stanley.zaremba@po.state.ct.us**
Telephone: 860-424-3704

Scheduling*

This shaded section will be filled out by DEP **Did/Will start on:*_____ Will be/Was completed on:*___**

Categories & Codes

NPS Functional Category of Activity*

Primary*: These activities are intended to identify the principal or main approach, remedy, or solution to achieve the objective of the project. If you select 100, 201, 202, 410, 600 then you must select all sources in the NPS primary category of pollution field. (Choose one primary category that has a numeric code from list below). To enter – select appropriate box and type value or choose appropriate default value.

Restoration/Protection/Prevention

Select boxes below	PRIMARY FUNCTIONAL CATEGORY OF ACTIVITY
☐	**010 - Corrective Action (other than BMP implementation)**
☐	**011 - BMP Design/Implementation**
☐	**012 - BMP Performance Assessment**
☐	**013 - Animal Manure/Litter Management Projects**
☐	**014 - Livestock Control Projects**
☐	**016 - Vegetation Management/Revegetation**
☐	**017 - Stream Bank Stabilization**
☐	**018 - Grade Stabilization**
☐	**019 - Sediment Control**
☐	**020 - Stormwater Discharge Design/ Control**
☐	**021 - Erosion Control Projects**
☐	**022 - Acquisition of Wetland Resources**
☐	**023 - Wetland Restoration/Protection**
☐	**024 - Acquisition of Riparian Resources**
☐	**025 - Riparian Projects**
☐	**026 - Fisheries Projects**
☐	**027 – Other Restoration/Protection/Prevention**
Education/Information Programs	
☐	**100 - Statewide Education/Information Programs**
☐	**101 - Local (Specific Target) Education/Information Programs**
Technical Assistance	
☐	**200 - Technical Assistance to State/Local**
☐	**201 - Nonpoint Source Program Overall Coordination/ Management**
☐	**202 - Nonpoint Source Project Staffing**
☐	**230 - Technology Transfer to State/ Local Government**
☐	**290 - Other Technical Assistance Activity**
Regulatory/Enforcement	
☐	**300 - Certification Activities**
☐	**310 - Program Development Activities**
☐	**320 - Inspection Activities**
☐	**330 - Ordinance Development**
☐	**340 - Enforcement Activities**

Select boxes below	PRIMARY FUNCTIONAL CATEGORY OF ACTIVITY
Planning	
☐	**401 - Nutrient Management Planning**
☐	**402 - Watershed Modeling Planning**
☐	**403 - Stormwater Management Planning**
☐	**404 - Watershed Restoration Action Strategy (WRAS)/Watershed Pl**
☐	**410 - Geographic Information Systems**
☐	**420 - Develop/Revise Basin Plans**
☐	**430 - TMDLs**
☐	**440 - Nonstructural Planning (for new development**
☐	**450 - Livestock Grazing System Planning**
☐	**490 - Other Planning**
Water Quality Assessment/Monitoring	
☐	**501 - In-stream Flow Assessments**
☐	**502 - Assessments for Compliance with Water Quality Standards**
☐	**503 - Wetland Assessment/ Monitoring**
☐	**504 - Riparian Assessment/ Monitoring**
☐	**505 - TMDL Assessments**
☐	**510 - Water Quality Trend Assessment**
☐	**520 - Water Quality Problem Identification**
☐	**590 - Other Water Quality Assessment /Monitoring**
Water Quality Assessment/Monitoring	
☐	600 - BMP Effectiveness Monitoring
☐	**610 - Biological Monitoring**
☐	620 - Watershed Assessments
319(h) National Monitoring Project	
☐	800 - 319(h) National Monitoring Project
Other Activities	
☐	**910 - Groundwater (all groundwater activities**
☐	**920 - Anti-degradation Activities and Analyses**
☐	**930 - Soil Analyses**

NPS Category of Pollution*

Primary:* The Primary NPS category of pollution is intended to identify the principal or main pollutant the project is attempting to correct. (Choose category/categories from list below. Enter estimated % of 319 funds). To enter – select appropriate box and type value or choose appropriate default value.		
Select items below	PRIMARY CATEGORY OF POLLUTION **(Select up to a maximum of five)**	**PERCENT AMOUNT % (increments of 10's to add up to 100%)**
☐	**0000 All Sources**	**%**
☐	**1000 Agriculture**	**%**
☐	**1600 Animal Feeding Operations**	**%**
☐	**2000 Silviculture**	**%**
☐	**3000 Construction**	**%**
☐	**4000 Urban Runoff/Stormwater**	**%**
☐	**5000 Resource Extraction**	**%**
☐	**6000 Land Disposal/Storage/Treatment**	**%**
☐	**7000 Hydromodification**	**%**
☐	**7900 Marinas and Recreational Boating**	**%**
☐	**8000 Other NPS Pollution**	**%**
☐	**8500 Historical Pollutants**	**%**
☐	**8700 Turf Management**	**%**
	Total Percent	**%**

Secondary Category of Pollution

Other NPS Categories of Pollution that apply to the project. Choose as many as appropriate - secondary category/categories from list below. To enter – select appropriate box and type value or choose appropriate default value.	
Select items below	SECONDARY CATEGORY OF POLLUTION
☐	**1100 - Non-Irrigated Crop Production**
☐	**1200 - Irrigated Crop Production**
☐	**1300 - Specialty Crop Production (e.g. horticulture/citrus/nuts/**
☐	**1350 - Grazing-Related Sources**
☐	**1400 - Pasture Grazing**
☐	**1500 - Range Grazing**
☐	**1700 - Aquaculture**
☐	**2100 - Harvesting/Residue Management**
☐	**2200 - Forest Management (e.g. pumped drainage/fertilization/pesticide app)**
☐	**2300 - Road Construction/Maintenance**
☐	**2990 - Reforestation**
☐	**3100 - Highways/Roads/Bridges**
☐	**3200 - Land Development or Redevelopment**
☐	**4190 - Municipal**
☐	**4191 - Commercial**

Select items below	SECONDARY CATEGORY OF POLLUTION
☐	**4192 - Residential (e.g. non-commercial automotive/pet waste/etc**
☐	**4400 - Illicit Connections/Illegal Hook-ups**
☐	**4450 - Dry Weather Flows**
☐	**4500 - Highway/Road/Bridge Runoff**
☐	**4590 - Post-Development Erosion and Sedimentation**
☐	**4650 - Salt Storage Sites**
☐	**5100 - Surface Mining**
☐	**5200 - Subsurface Mining**
☐	**5290 - Open Pit Mining**
☐	**5300 - Placer Mining**
☐	**5400 - Dredge Mining**
☐	**5500 - Petroleum Activities**
☐	**5600 - Mill Tailings**

☐	**5700 - Mine Tailings**
☐	**5800 - Abandoned Mine Drainage**
☐	**5990 - Sand/Gravel Mining**
☐	**6200 - Wastewater**
☐	**6300 - Landfills**
☐	**6350 - Inappropriate Waste Disposal**
☐	**6400 - Industrial Land Management**
☐	**6500 - On-site/Decentralized Wastewater Treatment**
☐	**6600 - Hazardous Waste**
☐	**6700 - Septage Disposal**
☐	**6800 - Waste Storage/Storage Tank Leaks (above ground)**
☐	**6900 - Waste Storage/Storage Tank Leaks (underground)**
☐	**7100 - Channelization**
☐	**7190 - Channel Erosion/Incision**
☐	**7200 - Dredging**
☐	**7300 - Dam Construction**
☐	**7350 - Upstream Impoundment**
☐	**7400 - Flow Regulations/Modification**
☐	**7550 - Other Habitat Modification**
☐	**7600 - Removal of Riparian Vegetation**
☐	**7700 - Streambank or Shoreline Modification/Destabilization**
☐	**7800 - Drainage/Filling of Wetlands**
☐	**7850 - Groundwater Withdrawal**
☐	**7990 - Pumpouts**
☐	**7991 - Sanitary On-Vessel Discharges**
☐	**7992 - Other On-Vessel Discharges**
☐	**7994 - Boat Construction**
☐	**7995 - Boat Maintenance**
☐	**7996 - Shoreline Erosion**
☐	**7997 - Fueling**
☐	**7998 - Dredging**
☐	**8050 - Erosion From Derelict Land**
☐	**8100 - Atmospheric Deposition**
☐	**8400 - Spills**
☐	**8590 - Contaminated Sediments**
☐	**8591 - Clean Sediments**
☐	**8592 - Other Historical Pollutants**
☐	**8600 - Natural Sources**
☐	**8700 - Recreational and Tourism Activities (non-boating)**
☐	**8710 - Golf Courses**
☐	**8790 - Yard Maintenance**
☐	**8791 - Other Turf Management**
☐	**8910 - Groundwater Loadings**
☐	**8950 - Wildlife**

BMP Category:*

Select items below.	BMP Name (Choose up to a maximum of 25 BMP's). To enter – select appropriate box and choose appropriate default value.	
☐	560	Access Road
☐	311	Alley Cropping
☐	921	Alternative Septic System
☐	914	Alternative Water Sources
☐	575	Animal Trails and Walkways
☐	450	Anionic Polyacrylamide (PAM) Erosion Control
☐	916	Baffle Boxes
☐	357	Barnyard Runoff Control
☐	310	Bedding
☐	314	Brush Management
☐	322	Channel Vegetation
☐	324	Chiseling & Subsoiling
☐	326	Clearing & Snagging
☐	397	Commercial Fishponds
☐	317	Composting Facility
☐	327	Conservation Cover
☐	328	Conservation Crop Rotation
☐	329	Conservation Tillage
☐	332	Contour Buffer Strips
☐	330	Contour Farming
☐	331	Contour Orchard/Other Fruit Area
☐	335	Controlled Drainage
☐	340	Cover/Green Manure Crop
☐	342	Critical Area Planting
☐	344	Crop Residue Use
☐	589A	Cross Wind Ridges
☐	589B	Cross Wind Stripcropping (ac)
☐	589C	Cross Wind Trap Strips
☐	348	Dam-Diversion
☐	402	Dam-Floodwater Retarding
☐	349	Dam-Multiple Purpose
☐	354	Delayed Seedbed Preparation
☐	356	Dike
☐	581	Ditch Stabilization
☐	362	Diversion
☐	007	Dredging
☐	432	Dry Hydrant
☐	771	Fabricated Shelter for Livestock (INTERIM)
☐	380	Farm & Feedlock Windbreak
☐	382	Fence
☐	386	Field Border
☐	392	Field Windbreak
☐	393	Filter Strip
☐	394	Firebreak
☐	396	Fish Passage
☐	398	Fish Raceway or Tank
☐	395	Fish Stream Improvement
☐	399	Fishpond Management
☐	400	Floodwater Diversion
☐	404	Floodway
☐	511	Forage Harvest Management
☐	652	Forest - Direct Seeding
☐	408	Forest - Erosion Control
☐	654	Forest - Improved Harvest
☐	409	Forest - Land Management
☐	660	Forest - Pruning
☐	490	Forest - Site Preparation
☐	666	Forest - Stand Improvement
☐	655	Forest - Trails and Landings
☐	391	Forest Buffer - Riparian
☐	410	Grade Stabilization Structure
☐	412	Grassed Waterway
☐	411	Grasses/Legumes Rotation
☐	352	Grazing - Deferred
☐	548	Grazing - Land Mechanical Treatment
☐	556	Grazing - Planned Systems
☐	528	Grazing - Prescribed
☐	011	Green Roof System
☐	647	Habitat Development/Management
☐	643	Habitat Restoration
☐	561	Heavy Use Area Protection
☐	422	Hedgerow Planting
☐	390	Herbaceous Cover - Riparian
☐	603	Herbaceous Wind Barriers
☐	423	Hillside Ditch
☐	920	In-lake alum treatment
☐	441	Irrigation - Microirrigation
☐	552B	Irrigation - Regulating Reservoir
☐	320	Irrigation Canal/Lateral
☐	428	Irrigation Ditch/Canal
☐	388	Irrigation Field Ditch
☐	464	Irrigation Land Leveling
☐	430	Irrigation Pipeline
☐	552A	Irrigation Pit
☐	442	Irrigation Sprinkler
☐	436	Irrigation Storage Reservoir
☐	443	Irrigation Surface/Subsurface
☐	447	Irrigation Tailwater Recovery
☐	441	Irrigation Trickle
☐	428B	Irrigation Water Conveyance, Ditch and Canal Lining, Flexible Membrane
☐	428C	Irrigation Water Conveyance, Ditch and Canal Lining, Galvanized Steel

☐	428A	Irrigation Water Conveyance, Ditch and Canal Lining, Non-reinforced Concrete
☐	430AA	Irrigation Water Conveyance, Pipeline, Aluminum Tubing
☐	430BB	Irrigation Water Conveyance, Pipeline, Asbestos-Cement
☐	430DD	Irrigation Water Conveyance, Pipeline, High-Pressure, Underground, Plastic
☐	430EE	Irrigation Water Conveyance, Pipeline, Low- Pressure, Underground, Plastic
☐	430CC	Irrigation Water Conveyance, Pipeline, Non-reinforced Concrete
☐	430GG	Irrigation Water Conveyance, Pipeline, Reinforced Plastic Mortar
☐	430HH	Irrigation Water Conveyance, Pipeline, Rigid Grated Pipeline
☐	430FF	Irrigation Water Conveyance, Pipeline, Steel
☐	449	Irrigation Water Management
☐	460	Land Clearing
☐	461	Land Reclamation
☐	543	Land Reconstruction - Abandoned Mine
☐	544	Land Reconstruction - Currently Mined
☐	452	Land Shaft & Audit Closing
☐	466	Land Smoothing
☐	454	Land Subsidence Treatment
☐	455	Land Toxic Discharge Control
☐	468	Lined Waterway or Outlet
☐	472	Livestock Exclusion
☐	634	Manure Transfer
☐	457	Mine Shaft and Audit Closing
☐	482	Mole Drain
☐	484	Mulching
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☐	010	Oil and Grit Separator
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☐	521C	Pond Sealing or Lining, Bentonite Sealant
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☐	554	Regulating Water in Drainage Systems
☐	329C	Residue Management
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☐	555	Rock Barrier
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☐	572	Spoil Spreading
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☐	580	Streambank and Shoreline Protection
☐	585	Stripcropping - Contour
☐	586	Stripcropping - Field
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☐	606	Subsurface Drain
☐	607	Surface Drain Field Ditch
☐	608	Surface Drain Main
☐	609	Surface Roughening
☐	600	Terrace
☐	610	Toxic Salt Reduction
☐	612	Tree/Shrub Establishment
☐	660A	Tree/Shrub Pruning (ac)
☐	614	Trough or Tank
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☐	645	Upland Wildlife Habitat Management
☐	901	Urban Catch Basin
☐	902	Urban Catch Basin - Oil

☐	903	Urban Catch Basin - Sand
☐	904	Urban Concrete Grid
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☐	906	Urban Filtration Basin
☐	907	Urban Grassed Swale
☐	908	Urban Infiltration Basin
☐	909	Urban Infiltration Trench
☐	910	Urban Porous Pavement
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☐	644	Wildlife – Wetland Management
☐	422A	Wind Barrier – Herbaceous
☐	650	Windbreak Renovation
☐	380	Windbreak/Shelterbelt Establishment

Watershed Information

Watershed Information. To enter – select appropriate box and type value or choose appropriate default value.		
Is this a statewide project? **(i.e. Education/Information or Demonstration?** ☐ YES ☐ NO If no **-provide information below:**		
Major Basin and Latitude/Longitude and location map of site(s) if applicable(attach map to completed form).		
	Major Basin: (i.e. Housatonic, Thames, Connecticut River, Southwest Coastal, South East Coastal, South Central Coastal)	
	Latitude:	**Longitude:**

Waterbody Information*

Waterbody Type* (select items below as appropriate) **To enter – select appropriate box and choose appropriate default value.**			
☐	**Coastal Marine**	☐	**Ponds**
☐	**Estuaries**	☐	**Reservoirs**
☐	**Great Lakes**	☐	**Rivers/Streams**
☐	**Groundwater**	☐	**Tidal Wetlands**
☐	**Lakes**	☐	**Non-tidal Wetlands**
☐	**Oceans**	☐	**Other**

Priority for Total Maximum Daily Load (TMDL) Development*

Is the Waterbody on the 303d list? If applicable, is this project noted in the most recent list of Connecticut Waterbodies Not Meeting Water Quality Standards (or Impaired Waters List) See: http://www.dep.state.ct.us/wtr/index.htm (scroll to water quality management program and select most recent list. The list is final and will be updated every 2 years. See appendix B for impaired designated use and priority). ☐ YES ☐ NO ☐ NOT APPLICABLE – STATWIDE PROJECT What is/are the impaired designated use(s)?
The priority for TMDL Development is (H,M,L,T) **For definition of TMDL see http://www.dep.state.ct.us/wtr/tmdl/index.htm** ☐ High ☐ Medium ☐ Low ☐ T (under study)
Funds from this project are being used for (Select item(s) below)*:

☐	**Developing a TMDL**
☐	**Developing a TMDL Implementation Plan(s) to achieve specific load-reduction goals**
☐	**Implementing a TMDL**
☐	**Not Applicable (N/A)**

Clean Lakes Information*

If "lake", "reservoir", or "pond" was selected along with other waterbody types do not complete the **CLEAN LAKES** data element. In this data element record the appropriate response "yes" or "no" in answering the question regarding clean lakes type of activity. If the answer is "no", then no further action is necessary. If the answer is "yes", complete the appropriate portion of the data element. ☐ **YES** ☐ **NO**	
Select item(s) below and enter $ amount:	
	Lake Water Quality Assessment (LWQA):
	Phase 1 Diagnostic/Feasibility Studies:
	Phase 2 Restoration/Implementation Projects:
	Phase 3 Post-Restoration Monitoring:
	Other lake-specific activity:
☐ YES ☐ NO	Does this activity relate to the development and implementation of statewide programs for lakes, reservoirs, or pond-related activities**? (If yes complete Program section below)**
Program*	
Select items below and Enter $ amount	
	Education and training:
	Technical assistance:
	Regulation/ordinance development:
	Other:

Environmental Goals/Achievements*

How do you plan to evaluate the effectiveness of this project?* **For this section, provide a narrative on how you plan to evaluate this project. Actual results will need to be reported at the end of this project. The investigator(s) will be responsible for quantifying benefits of the project in terms of pollutant load reduction to receiving water (before and after project implementation - e.g., reductions in nitrogen, phosphorus, and/or sediments, etc) or in terms of water quality improvement - e.g., ambient chemistry or meeting designated uses not previously met. For streambank and wetlands protection or restoration projects, the investigator will identify the linear feet of streambank, or acres of wetlands, to be protected or restored. Both qualitative and quantitative measures can be used in this section. Measures that may be used include such things as attendance at public meetings; number of volunteers recruited; acres of watershed surveyed; number of articles published; list of sites with BMPs known to be installed due to project.**	
Wetlands/Streambanks/Shorelines*	
Please select the appropriate item as it relates to the project or task. There should be a planned and actual (when available) positive numerical value for each selection (Alphanumeric entries will result in an error; negative numbers will compute to zero). **To enter – select appropriate box(s) and type value or choose appropriate default value. Select up to 4:**	
☐	**Wetlands restored - Number of Acres**
☐	**Wetlands created - Number of Acres**
☐	**Streambank and Shoreline Protection - Number of Linear Feet**
☐	**Streambank Channel Stabilization – Number of Linear Feet**
☐	**Not applicable**

Qualitative Measures

To enter – select appropriate box and type value or choose appropriate default value.

Measure	Number
Volunteers recruited	
Articles Published	
Acres of Watershed surveyed	
Attendance of public meeting(s) held	
Other Measures:	
Other Measures:	
Other Measures:	
Other Measures:	
Other Measures:	
Other Measures:	
Other Measures:	
Other Measures:	

Quantitative Measures

The federal EPA requires all 319 projects that will effectively reduce the load of Nitrogen, Phosphorus or Sediments to adjacent receiving waters to estimate the pounds of each pollutant that will be controlled. Because most of these projects are difficult and costly to field monitor, CT DEP is requesting only very basic information about project setting and scope from each grantee. DEP will calculate the potential pollutant load reductions using a simple model entitle Region 5 model.

- Is this project a BMP implementation project addressing nitrogen, phosphorus, and/or sediment?

☐ **YES** ☐ **NO** **If the answer is "YES" Please fill out the appropriate data form (1-5) attached.**

- If you are unable to fill out any of the data forms, you should at a minimum provide the following information:

1. What is the size of the watershed affected?
2. List the BMP(s) that will be utilized?
3. What pollutants are being targeted?
4. Information of pre-management load of the pollutant (i.e. If there is an erosion problem and it was estimated that 20 tons of sediment is getting into the stream) …then provide your perceived estimate.

Form 1. Agricultural Fields and Field Filter Strips
POLLUTANT REDUCTION DATA FORM SECTION 319 FUNDED PROJECTS

*Project No. *Project Name

*Today's Date: *Contact and Phone:

*Field Installation Start Date: *Completion of Field Installation:

*Soil Textural Class: (Check one)

Clay (clay, clay loam, and silt clay)

Silt (silt, silty clay loam, loam and silt loam)

Sand (sand, sandy clay, sandy clay loam, sandy loam, and loamy sand

Peat

Soil P Concentration (lb/lb soil) Soil N Concentration (lb/lb soil)

*Management Activity (e.g., filter strip, farming practice):

*New acres under management within this grant period:

(or provide topo sheet with area outlined. If several practices are being applied, please note practices on the map specific to the area of application)

*Old acres from prior years under *continuing* management:

(we need to know if a land owner who incorporated a BMP in prior years, such as nutrient management, is no longer actively participating in the program)

*** = Required Field**

Form 2. Feedlots
POLLUTANT REDUCTION DATA FORM SECTION 319 FUNDED PROJECTS

*Project No. *Project Name:

*Today's Date: *Contact and Phone:

*Field Installation Start Date: *Completion of Field Installation:

Number of Animals	Current Grant	Continuing*
Slaughter Steer		
Young Beef		
Dairy Cow		
Young Dairy Stock		
Swine		
Feeder Pig		
Sheep		
Turkey		
Chicken		
Duck		
Horse		

* Continuing from prior years, (i.e., cumulative number of animals in managed activity.)

*Management Activity (e.g., filter strip, retention basin):

*Area of feedlot: acres

*Area paved: 0-24% 25-49% 50-74% 75-100%

*** = Required Field**

Form 3. Gully Stabilization or Similar Activity
POLLUTANT REDUCTION DATA FORM SECTION 319 FUNDED PROJECTS

*Project No *Project Name:

*Today's Date *Contact and Phone

*Field Installation Start Date: *Completion of Field Installation

*Soil Textural Class: (Check one)

Sands, loamy sands
Silty clay loam, silty clay
Sandy loam
Clay loam
Fine sandy loam
Clay
Loams, sandy clay loams, sandy clay
Silt Loam
Organic

*Gully Top Width ft *Gully Bottom Width ft

*Gully Depth ft *Gully Length to be Stabilized ft

Soil P Concentration (lb/lb soil)

Soil N Concentration (lb/lb soil)

*Management Activity (e.g., rip rap, vegetation):

Form 4. Stream Bank Stabilization, Buffer or Similar Activity
POLLUTANT REDUCTION DATA FORM SECTION 319 FUNDED PROJECTS

*Project No._____*Project Name:_____

*Today's Date:_____ *Contact and Phone:_____

*Field Installation Start Date:_____ *Completion of Field Installation:_____

*Soil Textural Class: (Check one)

Sands, loamy sands_____
Sandy loam_____
Fine sandy loam_____
Loams, sandy clay loams, sandy clay_____
Silt Loam_____
Silty clay loam, silty clay_____
Clay loam_____
Clay_____
Organic_____

*Side 1 Bank Length_____ft *Side 2 Bank Length_____ft

*Side 1 Bank Height from Baseflow_____ft

*Side 2 Bank Height from Baseflow _____ft

Soil P Concentration (lb/lb soil)_____ Soil N Concentration (lb/lb soil)_____

*Management Activity (e.g., rip rap, vegetation):_____

*Lateral Recession Rate (if known, or estimated from table below):_____ft/yr

LRR (ft/yr)	Category	Description
0.01 - 0.05	Slight	Some bare bank but active erosion not readily apparent. Some rills but no vegetative overhang. No exposed tree roots.
0.06 - 0.2	Moderate	Bank is predominantly bare with some rills and vegetative overhang.
0.3 - 0.5	Severe	Bank is bare with rills and severe vegetative overhang. Many exposed tree roots and some fallen trees and slumps or slips. Some changes in cultural features such as fence corners missing and realignment of roads or trails. Channel cross-section becomes more U-shaped as opposed to V-shaped.
0.5+	Very Severe	Bank is bare with gullies and severe vegetative overhang. Many fallen trees, drains and culverts eroding out and changes in cultural features as above. Massive slips or washouts common. Channel cross-section is U-shaped and streamcourse or gully may be meandering

Form 5. Urban and Suburban Development
POLLUTANT REDUCTION DATA FORM SECTION 319 FUNDED PROJECTS

*Project No._____*Project Name:_____

*Today's Date:_____ *Contact and Phone:_____

*Field Installation Start Date:_____ *Completion of Field Installation:_____

*Acres of Land (If unknown, please attach topo map with area clearly marked):

	Sewered	Unsewered
Commercial	0	0
Industrial	0	0
Institutional	0	0
Transportation	0	0
Multi-Family	0	0
Residential	0	0
Agriculture	0	0
Vacant	0	0
Open Space	0	0

*Management Activity (e.g., filter strip, retention basin):____

Pollutants Controlled Calculation and Documentation for Section 319 Watersheds Training Manual *

Revised June 1999

Michigan Department of Environmental Quality
Surface Water Quality Division
Nonpoint Source Unit
P.O. Box 30273
Lansing, Michigan 48909
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* The original manual has been modified by EPA in accordance with changes made to the Region 5 load reduction model (see Exhibit 5). The Region 5 model is one option that states can use to estimate load reductions from Section 319 projects, as articulated in EPA's new reporting requirements starting with FY 2002-funded projects. June 2003

John Engler, Governor
Russell J. Harding, Director

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INTRODUCTION

This document provides instruction to the watershed technician regarding calculating and documenting pollutant reduction for the Surface Water Quality Division's Nonpoint Source Program. It can also be used in other watershed projects that treat the sources of sediment and nutrient pollutants using similar systems of Best Management Practices (BMPs). The purpose is to standardize the progress reporting in order that water quality impacts and statewide achievements can be systematically represented.

It is recognized that this system has limitations, but it does provide a uniform system of estimating relative pollutant loads. The methods are simple in concept and workable within a field office. This document includes instructions and examples regarding the calculation and documentation of pollutant reductions for: 1) sediment; 2) sediment-borne phosphorus and nitrogen; 3) feedlot runoff; and 4) commercial fertilizer, pesticides and manure utilization.

Water quality impacts from wind erosion will not be estimated. The dynamics of wind erosion and resulting atmospheric deposition do not perform similar to water erosion and quantifying these relationships for water quality is currently not possible. Likewise, the impacts of BMPs on ground water quality are not well enough understood to make pollutant reduction estimates feasible.

The following people contributed to this document: Ruth Shaffer, Gary Rinkenberger and Sean Duffey, USDA-NRCS; and John Suppnick and Thad Cleary, Michigan Department of Environmental Quality, Surface Water Quality Division.

Questions should be directed to the Michigan Department of Environmental Quality, Nonpoint Source Unit. The telephone number is 517-335-2867.

LEARNING OBJECTIVES

At the end of this training manual, the participant will be able to:

1. Define the term “Best Management Practices” (BMPs) and give examples used to treat different kinds of erosion;

2. Define erosion and sediment delivery and explain the difference between these processes;

3. List the assumptions that are used to relate gross erosion to resulting water quality impacts;

4. Calculate sediment and sediment-borne nutrient reductions from installation of conservation practices to control gully erosion;

5. Define Lateral Recession Rate and explain how it is determined in the field;

6. Calculate sediment and sediment-borne nutrient reductions from streambank/ditchbank treatment, livestock exclusion and from roadbank treatment.

7. Define Sediment Delivery Ratio, Nutrient Enrichment, Contributing Area, and how these relate to estimation of sediment delivery from upland agricultural fields.

8. Calculate sediment and sediment-borne nutrient reductions from implementation of conservation practices to control sheet and rill erosion from riparian fields.

9. Calculate additional savings in sediment and nutrients from the establishment of riparian filter strips.

10. Accurately complete the required reporting form for Integrated Crop Management with Nonpoint Source Program quarterly reports.

SEDIMENT REDUCTION

I. Background: Erosion and Sediment Delivery

The implementation of systems of **Best Management Practices (BMPs)** reduces nonpoint source pollution. BMPs are defined as structural, vegetative, or managerial conservation practices, which reduce or prevent detachment, transport and delivery of nonpoint source pollutants to surface or ground waters. The BMPs result in less soil being transported and deposited as sediment as well as fewer nutrients being delivered to the water bodies.

The BMPs in a water quality project must be targeted to **priority fields** within the watershed. Priority fields are cropland, pastureland or hayland that contribute runoff to adjacent hydrologic systems such as lakes, streams, ditches, wetlands and flood plains. Reporting of pollutant reductions will be done for all priority fields where BMPs have been installed.

Sediment and nutrient reduction is estimated by first calculating gross erosion at a site, then calculating the amount of soil and nutrients that are transported to the surface waters. Sediment and sediment-borne nutrients originate from various types of erosion. Each of these erosion types can be estimated by accepted methods of technology to determine gross erosion. The Revised Universal Soil Loss Equation (RUSLE), the Gully Erosion Equation (GEE), and the Channel Erosion Equation will be used to calculate gross erosion. The various types of erosion and the equations used to calculate gross erosion are discussed later in this chapter.

It is important to recognize the difference between "soil loss" as measured by these erosion equations and the sediment delivery to water bodies. **Erosion** is a naturally occurring process, which is defined as the wearing away or disintegration of earth material by the physical forces of moving water and wind. **Sediment delivery** is the amount or fraction of soil that is actually delivered to a water body.

To relate gross soil erosion to water quality impacts, certain assumptions and professional judgments need to be made. Sediment delivery and the nutrient content of the sediment will be estimated using other equations and values from the scientific literature.

Finally, it is important to know how soil loss tolerance relates to water quality. Soil loss tolerance, as measured by equations such as the Revised Universal Soil Loss Equation, is a measure of the amount of soil that can be removed from a site before *soil productivity onsite* is affected. It is a soil quality term, not water quality. It is <u>not</u> a measure of the amount of soil that moves offsite. Other factors such as proximity to a water body and the size of the area contributing sediment to the edge of the field must be considered to determine the amount of sediment that actually reaches water.

The following assumptions will be made when calculating sediment and nutrient reductions:

1. The point of deposition at the edge of field will be the basis for the sediment and nutrient reduction estimates. Sediment can be deposited into a stream, lake, ditch, or a wetland or floodplain adjacent to a stream, lake or ditch. All of these water bodies are important and warrant pollutant protection. Therefore, it will be our intent to represent the sediment and nutrient reduction at the boundary where the agricultural field or site joins these hydrologic systems. The amount of sediment delivered to the edge of the field may be 100% in the case of streambank or gully erosion sites directly on or adjacent to a water body. In the case of upland erosion sites, the percent of soil delivered to the water as sediment will be

less than 100%; we will discuss how to estimate the amount delivered to a water body from upland erosion sites later in this chapter.

2. Once the system of BMPs is established, the stabilized condition is assumed to control all the erosion. Therefore the "before" condition is measured in average annual tons of sediment generated (i.e., without treatment), and the "after" condition is assumed to be negligible.

3. Phosphorus and nitrogen reductions are assumed to come from reduction in *sediment-borne* nutrients. Nutrients that are dissolved and carried by runoff waters are not included.

4. Pollutant reduction savings are reported to the nearest whole number (i.e., 8 instead of 8.23).

Student Exercise 1.

1. Define “erosion” and “sediment delivery”.

2. True or False: The soil loss tolerance is a measure of the amount of soil that is deposited in a water body.

3. The basis for calculating sediment and nutrient reduction estimates will be the point of _____.

Student Exercise 1. - Answers

1. Define “erosion” and “sediment delivery”.

Erosion *is the wearing away or disintegration of earth material by the physical forces of moving wind and water.*

Sediment delivery *is the amount or fraction of soil that is actually delivered to a water body.*

2. True or False: The soil loss tolerance is a measure of the amount of soil that is deposited in a water body.

False. Soil loss tolerance is a measure of the amount of soil that can be removed from a site before soil productivity is affected onsite.

3. The basis for calculating sediment and nutrient reduction estimates will be the point of *deposition at the edge of the field.*

II. Gully Stabilization

The Gully Erosion Equation (GEE) will be used for calculating annual sediment and attached phosphorus and nitrogen reductions. These calculations are based on the NRCS Field Office Technical Guide, Section I-C, Gully Erosion Equation:

Sediment Reduction:

Gully Erosion Equation (GEE) =

$$\frac{\text{Top Width(ft.) + Bottom Width(ft.)/2 x Depth(ft.) x Length(ft) x Soil Weight (tons/ft}^3\text{)}}{\text{Number of Years}}$$

Refer to Exhibit 1 in the Appendix for dry density soil weights for different soil textures. The number of years that a gully took to form (listed in the equation's denominator) can be estimated from field records, from discussions with the landowner, or from observation and professional judgment.

The GEE can be used to estimate sediment and nutrient reduction following the installation of the following conservation practices:

1. Grade Stabilization Structure
2. Grassed Waterway
3. Critical Area Planting in areas with gullies
4. Water and Sediment Control Basin

Once the conservation practice is established, the stabilized condition will have controlled all the gully erosion. Therefore, report the average annual tons of gross erosion as sediment delivered at the edge of the field (100% delivery).

Report conservation practices separately. For example, if a grade stabilization structure and grassed waterway are installed together at one site, the GEE should be used to estimate the sediment reduction from each practice and they should be reported separately.

Nutrient Reduction:

Nutrient reduced (lb/yr) =

Sediment reduced (T/yr) x Nutrient conc. (lb/lb soil) x 2000 lb/T x correction factor

The amount of attached phosphorus and nitrogen is calculated using information collected by USDA-ARS researchers (Frere et al., 1980). The estimate starts with an overall phosphorus concentration of 0.0005 lbP/lb of soil and a nitrogen concentration 0.001 lbN/lb of soil. Then a general soil texture is determined, and a correction factor is used to better estimate nutrient-holding capacity (Exhibit 2 in Appendix). A loamy soil has a correction factor of 1.0, while clay and muck soils are greater than 1.0 and sandy soils are less than 1.0. This correction factor reflects the fact that soils with higher clay and organic matter contents have a higher capacity to hold nutrients, while sandier soils have a lower nutrient capacity.

The following example illustrates how to calculate sediment and nutrient reductions.

Example 1.

Farmer Brown installs an aluminum toewall set back 20 feet from the stream, and 480 linear feet of grassed waterway. The soil texture is a loamy sand. The gully can be divided into three reaches A, B and C. Reach A is 8 feet wide at the top, 4 feet deep, 3 feet wide at the bottom and 200 linear feet long. Reach B is 5 feet wide at the top, 2 feet deep, 2 feet wide at the bottom and 150 linear feet. Reach C is 3 feet wide at the top, 1 foot deep, 1 foot wide at the bottom and 130 linear feet. The gully was formed in three years. Calculate the sediment and nutrient reductions for each practice.

Sediment Reduction Calculations:

Grade Stabilization Structure:

$$\text{Sediment} = \frac{(8\text{ft.} + 3\text{ft})/2 \times 4\text{ft} \times 20\text{ft} \times 0.055\ \text{tons/ft}^3}{3\ \text{years}} = 8\ \text{tons/yr.}$$

Grassed Waterway:

Reach A:

$$\text{Sediment} = \frac{(8\text{ft} + 3\text{ft})/2 \times 4\text{ft} \times 200\text{ft} \times 0.055\ \text{tons/ft}^3}{3\ \text{years}} = 80.7\ \text{tons/yr.}$$

Reach B:

$$\text{Sediment} = \frac{(5\text{ft} + 2\text{ft})/2 \times 2\text{ft} \times 150\text{ft} \times 0.055\ \text{tons/ft}^3}{3\ \text{years}} = 19.3\ \text{tons/yr.}$$

Reach C:

$$\text{Sediment} = \frac{(3\text{ft} + 1\text{ft})/2 \times 1\text{ft} \times 130\text{ft} \times 0.055\ \text{tons/ft}^3}{3\ \text{years}} = 4.8\ \text{tons/yr.}$$

Total sediment reduction (grassed waterway) = A + B + C = 104.8 tons/yr.
Round to 105 tons/yr.

Nutrient Reduction Calculation:

Nutrient reduced (lb/yr) =

Sediment reduced (T/yr) x Nutrient conc. (lb/lb soil) x 2000 lb/T x correction factor

The phosphorus reduction is calculated by multiplying the phosphorus concentration by the sediment reduction and correcting for the soil texture. The same method is used to calculate the nitrogen reduction. Use a soil phosphorus concentration of 0.0005 lbP/lb soil, and a soil nitrogen concentration of 0.001 lbN/lb soil (Frere et al., 1980). According to Exhibit 2, a loamy sand is classified as a Sand and has a correction factor of 0.85:

Grade Stabilization Structure:

Reduction in P= 8 tons/yr x 0.0005 lbP/lb soil x 2000 lb/ton x 0.85
= 6.89 lb/yr
Round to 7 lb/yr

Reduction in N= 8 tons/yr x 0.001 lbN/lb soil x 2000 lb/ton x 0.85
= 13.6 lb/yr
Round to 14 lb/yr

Grassed Waterway:

Reduction in P= 104.8 tons/yr x 0.0005 lbP/lb soil x 2000 lb/ton x 0.85
= 89.3 lb/yr
Round to 89 lb/yr

Reduction in N= 104.8 tons/yr x 0.001 lbN/lb soil x 2000 lb/ton x 0.85
= 178.5 lb/yr
Round to 179 lb/yr

Student Exercise 2.

1. A geotextile chute and a critical area planting are installed on a gully that is 10 feet from a county drain. The soil texture is a silty clay loam. The original gully was 3 feet wide at the top, 3 feet deep, 2 feet wide at the bottom and 15 linear feet long. The gully was formed in three years. Calculate the sediment and nutrient reductions for each practice.

2. Explain why the soil phosphorus rate of 0.0005 lbP/lb of soil is modified with a correction factor for soil texture.

Student Exercise 2. - Answers

1. A geotextile chute and a critical area planting are installed on a gully that is 10 feet from a county drain. The soil texture is a silty clay loam. The original gully was 3 feet wide at the top, 3 feet deep, 2 feet wide at the bottom and 15 linear feet long. The gully was formed in three years. Calculate the sediment and nutrient reductions for each practice.

Geotextile Chute Sediment and Nutrient Reduction:

$$\text{Sediment reduced} = \frac{(3\text{ft} + 2\text{ft})/2 \times 3\text{ft} \times 10\text{ft} \times 0.04\ \text{tons/ft}^3}{3\ \text{yrs}} = 1\ \text{ton/yr}$$

$$\text{Reduction in P} = 1\ \text{ton/yr} \times 0.0005\ \text{lbP/lb soil} \times 2000\ \text{lb/ton} \times 1.0$$
$$= 1\ \text{lb/yr}$$

$$\text{Reduction in N} = 1\ \text{ton/yr} \times 0.001\ \text{lbN/lb soil} \times 2000\ \text{lb/ton} \times 1.0$$
$$= 2\ \text{lbs/yr}$$

Critical Area Planting Sediment and Nutrient Reduction:

$$\text{Sediment reduced} = \frac{(3\text{ft} + 2\text{ft})/2 \times 3\text{ft} \times 15\text{ft} \times 0.04\ \text{tons/ft}^3}{3\ \text{yrs}} = 1.5\ \text{tons/yr}$$

Round to 2 tons/yr

$$\text{Reduction in P} = 1.5\ \text{tons/yr} \times 0.0005\ \text{lbP/lb soil} \times 2000\ \text{lb/ton} \times 1.0$$
$$= 1.5\ \text{lbs/yr}$$

Round to 2 lbs/yr

$$\text{Reduction in N} = 1.5\ \text{tons/yr} \times 0.001\ \text{lbN/lb soil} \times 2000\ \text{lb/ton} \times 1.0$$
$$= 3\ \text{lbs/yr}$$

2. Explain why the soil phosphorus rate of 0.0005 lbP/lb of soil is modified with a correction factor for soil texture.

The correction factor reflects the fact that soils with higher clay and organic matter contents have a higher capacity to hold phosphorus, while sandier soils have a lower phosphorus-holding capacity.

III. Streambank/Ditchbank and Roadbank Stabilization; Livestock Access

Sediment Reduction

The **Channel Erosion Equation (CEE)** is used to calculate the annual average sediment reduction using the direct volume method:

CEE = Length (ft.) x Height (ft.) x LRR (ft./yr.) x Soil weight (ton/ft^3)

where LRR is Lateral Recession Rate. The dry density soil weight is given in Exhibit 1 (in the Appendix). Assume 100% delivery of the eroded soil to the stream.

The Channel Erosion Equation will be used to calculate annual sediment and attached phosphorus and nitrogen reductions following the installation of conservation practices such as:

1. Animal Trails and Walkways
2. Stream Channel Stabilization
3. Streambank Protection

This calculation contrasts the original bank slope with the existing repose. The rate at which bank deterioration has taken place is an important variable to determine. The Lateral Recession Rate (LRR) is the thickness of soil eroded from a bank surface (perpendicular to the face) in an average year. Recession rates are measured in feet per year. However, a channel bank may not erode for a period of years when no major runoff events occur. When a major storm does occur, the bank may be cut back tens of feet for a short distance. It is necessary to assign recession rates to banks with such a process in mind. If ten feet of bank has been eroded, the ten feet must be adjusted to an average annual lateral recession rate rather than a recession rate for one storm.

Selecting the lateral recession rate is the most critical step in estimating channel erosion using the direct volume method. A historical perspective is required in many instances. Old photographs, old survey records, and any information that tells you what a bank looked like at known times in the past are very useful. In most instances, such information is lacking and field observations and judgment are needed to estimate recession rates.

Exposed bridge piers, suspended outfalls or culverts, suspended fence lines, and exposed tree roots are all good indicators of lateral recession rate. Discoloration of bridge piers may show the original channel bottom elevation. Given the date of bridge installation, a recession rate can be calculated for that reach of stream. Culverts are generally installed flush with a bank surface. The amount of culvert exposed and age of the culvert will allow you to calculate a lateral recession rate.

Exposed tree roots are probably the most common field evidence of later recession. Consult references to familiarize yourself with tree height and appearance as related to tree age. Roots will not grow towards a well drained, exposed, eroding channel bank. The amount of root exposed should be increased by at least a factor of 2X to account for soil that was in the bank and that the root was growing in. By multiplying the length of root exposed by at least two and dividing by the age of the tree, an estimated lateral recession rate can be obtained.

As can be seen in the discussion above, there are few instances where you will be able to measure lateral recession rates in the field. Experience and professional judgment are

generally required to estimate recession rates for channel erosion. Because of this the following information has been compiled for your use which relates recession rates. Figure 1 relates lateral recession rates to narrative descriptions of streambank or ditchbank erosion. Figure 2 gives lateral recession rates for varying degrees of erosion at roadbanks or road stream crossings.

Figure 1. Lateral Recession Rates of Stream/Ditchbanks as Estimated by Field Observations.

Lateral Recession Rate (ft./yr.)	Category	Description
0.01 - 0.05	Slight	Some bare bank but active erosion not readily apparent. Some rills but no vegetative overhang. No exposed tree roots.
0.06 - 0.2	Moderate	Bank is predominantly bare with some rills and vegetative overhang.
0.3 - 0.5	Severe	Bank is bare with rills and severe vegetative overhang. Many exposed tree roots and some fallen trees and slumps or slips. Some changes in cultural features such as fence corners missing and realignment of roads or trails. Channel cross-section becomes more U-shaped as opposed to V-shaped.
0.5+	Very Severe	Bank is bare with gullies and severe vegetative overhang. Many fallen trees, drains and culverts eroding out and changes in cultural features as above. Massive slips or washouts common. Channel cross-section is U-shaped and streamcourse or gully may be meandering.

Source: Steffen, L.J., 1982.

Figure 2. Lateral Recession Rates of Roadbanks as Estimated by Field Observations.

Lateral Recession Rate (ft./yr.)	Category	Description
0.01 - 0.05	Slight	Some bare roadbank but active erosion not readily apparent. Some rills but no vegetative overhang. Ditch bottom is grass or noneroding.
0.06 - 0.15	Moderate	Roadbank is bare with obvious rills and some vegetative overhang. Minor erosion or sedimentation in ditch bottom.
0.16 - 0.3	Severe	Roadbank is bare with rills approaching one foot in depth. Some gullies and overhanging vegetation. Active erosion or sedimentation in ditch bottom. Some fenceposts, tree roots, or culverts eroding out.
0.3+	Very Severe	Roadbank is bare with gullies, washouts, and slips. Severe vegetative overhang; fenceposts, powerlines, trees and culverts eroded out. Active erosion or sedimentation in ditch bottoms..

Source: Steffen, L.J., 1982.

To estimate channel erosion, first determine the slope height and length of the eroding banks. By field observation, match the appearance of the eroding areas with the narratives shown to identify what category the erosion is in. Once you have characterized the erosion, note whether all the symptoms discussed in the Description are present or if only a few symptoms occur. If only a few of the symptoms in the Description characterizing the eroding area are evident, you may want to use the low end of the range of recession rates shown for the Category.

When you are actually observing sample areas in the field, you will probably note that eroding areas are mixed in severity and in frequency of occurrence. As an example, a 500- foot long streambank may generally be in the moderate erosion category (0.06 feet/year). A few 50-foot reaches within that 500- foot reach may be eroding very severely (0.5+ feet/year). Since we are interested in the average tons of erosion per year you could increase the lateral recession rate to 0.1 feet/year and use that for the entire 500- foot reach. This simplifies data collection and decreases time in the field, without jeopardizing the level of accuracy of your calculation.

Student Exercise 3.

1. Define Lateral Recession Rate_____

_____

_____

2. Name four tools or techniques that can be used to estimate Lateral Recession Rate.

3. The following illustration is of a landowner standing next to a streambank. The landowner complains of losing land, and that his fence corner had to be set back farther from the edge of the stream. Given the illustration and the Descriptions in Figure 1., choose the Categories and range of Lateral Recession Rates that fit the example.

Student Exercise 3. - Answers

1. Define Lateral Recession Rate (LRR)

*The **Lateral Recession Rate (LRR)** is the thickness of soil eroded from a bank surface (perpendicular to the face) in an average year. It is given in feet per year.*

2. Name four tools or techniques that can be used to estimate Lateral Recession Rate.

Old photograph, old survey records, observations of exposed bridge piers, suspended outfalls or culverts, suspended fence lines, exposed tree roots, and the Descriptions given in Figures 1 and 2 are all good indicators.

3. The following illustration is of a landowner standing next to a streambank. The landowner complains of losing land, and that his fence corner had to be set back farther from the edge of the stream. Given the illustration and the Descriptions in Figure 1, choose the Categories and range of Lateral Recession Rates that fit the example.

Based on the Descriptions in Figure 1, the landowner categorized this site as Severe (0.3 to 0.5 ft/yr) or Very Severe (0.5+ ft/yr). There is vegetative overhang at the top of the bank, and changes in cultural features (fence corner needing to be moved).

Nutrient Reduction:

Nutrient reduced (lb/yr) =

Sediment reduced (T/yr) x Nutrient conc. (lb/lb soil) x 2000 lb/T x correction factor

To calculate phosphorus and nitrogen reductions, use the same method as used to calculate nutrient reductions from gully erosion treatment. For example, the phosphorus reduction is based on a concentration of 0.0005 lbP/lb of soil, and is calculated by multiplying the reduction in sediment by the phosphorus concentration and correcting for soil texture. Assume 0.001 lbN/lb of soil as well.

Example 2.

Farmer Brown installed 1,000 feet of barbed wire fence to prevent cattle from entering the stream from the west side of the stream. The trodden banks were 4 feet high. The banks were bare and the cross-section was a flat U-shape. Trees were uprooted and fallen. Washouts were evident. The cattle no longer use the east bank of the stream for pasture. Three hundred feet of the east bank and one thousand feet of the west bank were shaped and stabilized with grass vegetation. Prior to these improvements, the cattle had complete access. The soil is a silt clay. Calculate the reduction in sediment and nutrients for this practice.

The technician categorized the annual lateral recession rate as Severe (0.4 ft./yr.). According to Exhibit 2., a silt clay is categorized as a Clay with a 1.15 correction factor.

East Bank and West Bank Sediment Reduction:

Sediment Reduction = Length x Height x LRR x soil weight

West Bank Sediment = 1000ft x 4ft x 0.4ft/yr x 0.04 tons/ft^3
= 64 tons/yr

East Bank Sediment = 300ft x 4ft x 0.4ft/yr x 0.04 tons/ft3
= 19.2 tons/yr

Total Sediment Reduction = 64 + 19.2 = 83.2 tons/yr
Round to 83 tons/yr

Phosphorus and Nitrogen Reduction:

Reduction in P = 83.2 tons/yr x 0.0005 lbP/lb x 2000 lb/ton x 1.15
= 95.68 lb/yr
Round to 96 lb/yr

Reduction in N = 83.2 tons/yr x 0.001 lbN/lb x 2000 lb/ton x 1.15
= 191.36 lb/yr
Round to 191 lb/yr

Student Exercise 4.

1. In the example give in Student Exercise 3., the landowner chose to armor the toe of the streambank with riprap, pull the slope of the bank back to a 2:1 ratio and revegetate the streambank with shrubs and grass. The original bank height was 6 feet, and the length is 150 feet. Based on field observations and information in Figure 1., the technician estimated that the erosion was severe (0.05 ft/yr). The soil texture is a loamy sand.

Calculate the reduction in sediment and nutrients from streambank stabilization.

2. The road commission wants to stabilize a roadbank that is washing out a road into a stream. The roadbank is 4 feet high, and the washout covers a length of 20 feet. The technician estimates from Figure 2 that the erosion rate is severe (0.2 ft/yr). The soil texture is a loamy sand.

Calculate the reduction in sediment and nutrients from roadbank stabilization.

Student Exercise 4. - Answer

1. In the example give in Student Exercise 3., the landowner chose to armor the toe of the streambank with riprap, pull the slope of the bank back to a 2:1 ratio and revegetate the streambank with shrubs and grass. The original bank height was 6 feet, and the length is 150 feet. Based on field observations and information in Figure 1., the technician estimated that the erosion was severe (0.05 ft/yr). The soil texture is a loamy sand.

Calculate the reduction in sediment and nutrients from streambank stabilization.

Sediment reduced = 6ft x 150ft x 0.05 ft/yr x 0.055 tons/ft^3
= 2.475 tons/yr
Round to 2 tons/yr

Reduction in P = 2.475 tons/yr x 0.0005 lbP/lb x 2000 lb/ton x 0.85
= 2.1 lb/yr
Round to 2 lb/yr

Reduction in N = 2.475 tons/yr x 0.001 lbN/lb x 2000 lb/ton x 0.85
= 4.2 lb/yr
Round to 4 lb/yr

2. The road commission wants to stabilize a roadbank that is washing out a road into a stream. The roadbank is 4 feet high, and the washout covers a length of 20 feet. The technician estimates from Figure 2 that the erosion rate is severe (0.2 ft/yr). The soil texture is a loamy sand.

Calculate the reduction in sediment and nutrients from roadbank stabilization.

Sediment reduced = 4ft x 20ft x 0.02 ft/yr x 0.055 tons/ft^3
= tons/yr
Round to 2 tons/yr

Reduction in P = 2.475 tons/yr x 0.0005 lbP/lb x 2000 lb/ton x 0.85
= 2.1 lb/yr
Round to 2 lb/yr

Reduction in N = 2.475 tons/yr x 0.001 lbN/lb x 2000 lb/ton x 0.85
= 4.2 lb/yr
Round to 4 lb/yr

IV. Agricultural Fields

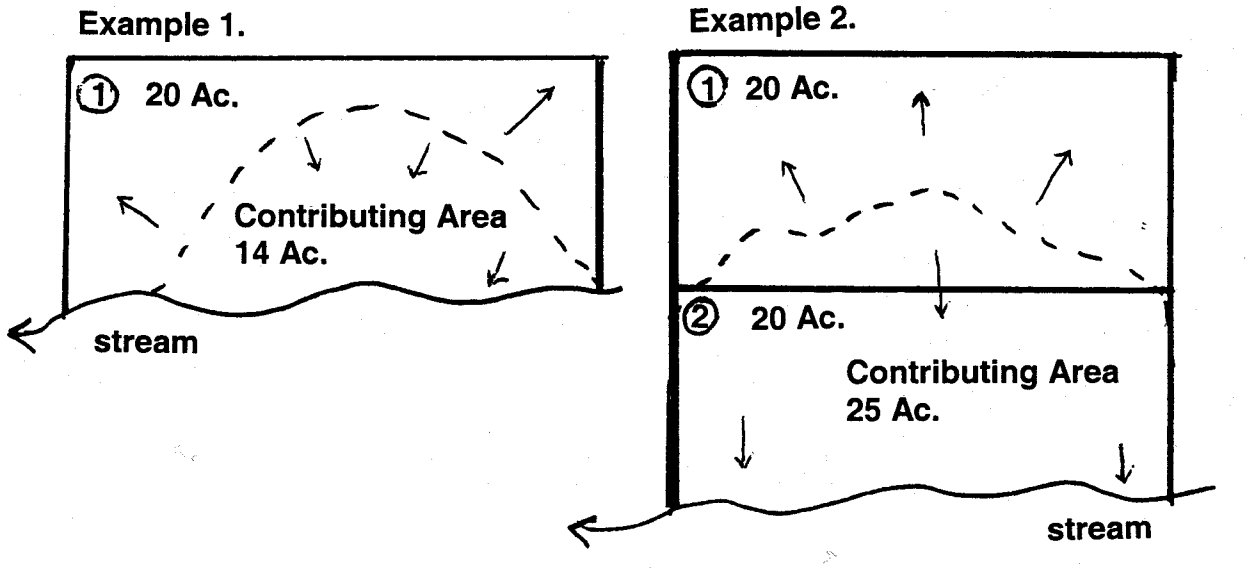
This method will be used to calculate average annual sediment and attached phosphorus and nitrogen reductions following establishment of conservation practices such as these:

Prescribed Grazing
Residue Management, Mulch Till
Conservation Crop Rotation
Conservation Cover
Cover and Green Manure
Critical Area Planting
Stripcropping, Contour
Stripcropping, Field

The methods used to estimate the amount of sediment and nutrients that reach a waterbody from upland areas differs significantly from the methods described earlier. We will first review some of the concepts used to determine sediment delivery and the resulting amount of sediment-borne nutrients.

One of the first steps in determining how much eroded soil reaches a water body is to determine the **contributing area.** The contributing area is the portion of the priority field, which contributes eroded soil to the water body. The contributing area will usually differ in size from the priority field and is defined by the runoff flowpath and by topography. The flowpath is the direction runoff flows, either towards or away from the edge of field adjacent to the hydrologic system (stream, lake, ditch, floodplain, wetland, etc.) that is being protected. The contributing area may be larger than the priority field or smaller than it. See the diagrams below for examples.

Figure 3. Contributing Area Examples



In both examples, the priority field is managed with appropriate Best Management Practices, but only the contributing area is used to calculate sediment and nutrient reductions.

The next step in determining the amount of sediment is to estimate the fraction of eroded soil that will be deposited at the edge of the priority field. This is referred as the **sediment delivery ratio**. The contributing area acts as a subwatershed, with runoff water carrying sediment towards the edge of field. As the size of the contributing area increases, the flowpath increases and the amount of soil that actually reached the field edge decreases, as there is an increased chance of soil dropping out of suspension and being deposited in the field. Figure 4 gives the relationship between the size of the contributing drainage area and the sediment delivery ratio. The relationship between the amount of soil transported and deposited as sediment versus the size of the contributing area is represented by a curve. Note that as the contributing area increases to ten acres, the delivery ratio sharply drops to 0.7 (70% of the original eroded soil). If the contributing area increases to 160 acres, the sediment delivery ratio decreases to 0.5, (i.e., only 50% of the originally eroded soil may reach the edge of the field.).

As soil is carried by overland flow, heavier particles like sand drop out of suspension. Finer particles such as silt and clay particles are carried farther, so that when soil actually reaches a water body and is deposited as sediment, the texture is very different from the original soil from which it was eroded. As we discussed earlier, silt and clay soils have a higher nutrient-holding capacity. This increase in sediment-borne nutrients during sediment delivery is called **nutrient enrichment**. In general, as the contributing area increases, the sediment delivery decreases but the sediment-borne nutrient content in the resulting sediment increases. In this case, therefore, values for nutrient content of soil derived from Frere et al. (1980) (0.0005 lbP/lb soil and 0.001 lbN/lb soil) cannot be used.

Researchers from the USDA-ARS developed algorithms for use in models such as AgNPS and CREAMS, which adjust nutrient content of the sediment as the size of the contributing area increases and the sediment delivery decreases. These equations were based on field and laboratory studies, and are expressed as differential equations, not linear functions. Therefore, the amount of sediment-borne nutrients reduced as sediment delivery is reduced has been put in a table for the technician to use. This look-up table is given in Figure 5.

Figure 4. Sediment Delivery Ratios Based on Contributing Drainage Area.

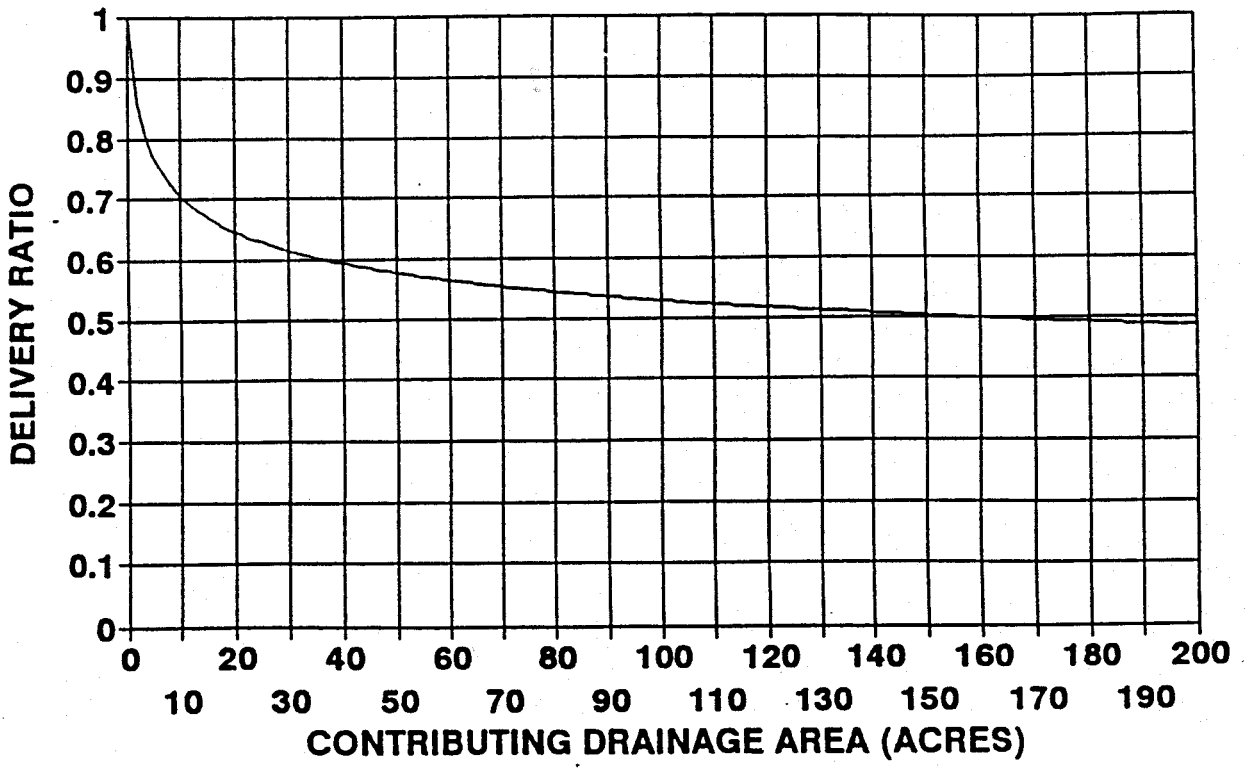


Figure 5. Phosphorus and Nitrogen Content of Sediment Delivered by Sheet and Rill Erosion. (Derived from AGNPS equations in Young et al, 1987).

Sediment Delivery T/AC/YR	Phosphorus (lbs/ac/yr)				Nitrogen (lbs/ac/yr)			
	Clay	Silt	Sand	Peat	Clay	Silt	Sand	Peat
0.01	0.05	0.04	0.03	0.06	0.09	0.08	0.07	0.12
0.02	0.08	0.07	0.06	0.10	0.16	0.14	0.12	0.21
0.03	0.11	0.10	0.08	0.15	0.22	0.19	0.16	0.29
0.04	0.14	0.12	0.10	0.18	0.28	0.24	0.21	0.37
0.05	0.17	0.15	0.12	0.22	0.33	0.29	0.25	0.44
0.06	0.19	0.17	0.14	0.25	0.39	0.34	0.29	0.51
0.07	0.22	0.19	0.16	0.29	0.44	0.38	0.32	0.57
0.08	0.24	0.21	0.18	0.32	0.49	0.42	0.36	0.64
0.09	0.27	0.23	0.20	0.35	0.54	0.47	0.40	0.70
0.1	0.29	0.25	0.22	0.38	0.58	0.51	0.43	0.76
0.2	0.51	0.44	0.38	0.66	1.01	0.88	0.75	1.32
0.3	0.70	0.61	0.52	0.92	1.40	1.22	1.04	1.83
0.4	0.88	0.77	0.65	1.15	1.77	1.54	1.31	2.30
0.5	1.06	0.92	0.78	1.38	2.11	1.84	1.56	2.75
0.6	1.22	1.06	0.90	1.59	2.44	2.12	1.81	3.19
0.7	1.38	1.20	1.02	1.80	2.76	2.40	2.04	3.61
0.8	1.54	1.34	1.14	2.01	3.08	2.67	2.27	4.01
0.9	1.69	1.47	1.25	2.20	3.38	2.94	2.50	4.41
1	1.84	1.60	1.36	2.40	3.68	3.20	2.72	4.80
2	3.20	2.78	2.37	4.18	6.40	5.57	4.73	8.35
3	4.43	3.85	3.27	5.78	8.86	7.70	6.55	11.55
4	5.57	4.85	4.12	7.27	11.15	9.69	8.24	14.54
5	6.66	5.79	4.92	8.69	13.33	11.59	9.85	17.38
6	7.71	6.70	5.70	10.06	15.42	13.41	11.40	20.11
7	8.72	7.58	6.45	11.38	17.44	15.17	12.89	22.75
8	9.70	8.44	7.17	12.66	19.41	16.88	14.35	25.32
9	10.7	9.27	7.88	13.91	21.33	18.55	15.76	27.82
10	11.6	10.09	8.57	15.13	23.20	20.18	17.15	30.26
12	13.4	11.67	9.92	17.51	26.85	23.34	19.84	35.02
13	14.3	12.4	10.6	18.7	28.6	24.9	21.2	37.33
14	15.2	13.2	11.2	19.8	30.4	26.4	22.4	39.61
15	16.0	14.0	11.9	20.9	32.1	27.9	23.7	41.86
16	16.9	14.7	12.5	22.0	33.8	29.4	25.0	44.08
17	17.7	15.4	13.1	23.1	35.5	30.8	26.2	46.27
18	18.6	16.1	13.7	24.2	37.1	32.3	27.4	48.43
19	19.4	16.9	14.3	25.3	38.8	33.7	28.7	50.57
20	20.2	17.6	14.9	26.3	40.4	35.1	29.9	52.69
21	21.0	18.3	15.5	27.4	42.0	36.5	31.0	54.79
22	21.8	19.0	16.1	28.4	43.6	37.9	32.2	56.87
23	22.6	19.6	16.7	29.5	45.2	39.3	33.4	58.93
24	23.4	20.3	17.3	30.5	46.7	40.6	34.5	60.97
25	24.1	21.0	17.8	31.5	48.3	42.0	35.7	62.99
26	24.9	21.7	18.4	32.5	49.8	43.3	36.8	65.00
27	25.7	22.3	19.0	33.5	51.4	44.7	38.0	66.99
28	26.4	23.0	19.5	34.5	52.9	46.0	39.1	68.97
29	27.2	23.6	20.1	35.5	54.4	47.3	40.2	70.93
30	27.9	24.3	20.7	36.4	55.9	48.6	41.3	72.88

Student Exercise 5.

1. Define the following terms:

   contributing area

   sediment delivery ratio

   nutrient enrichment

2. Circle the correct choices:

   "As the size of the contributing area increases, the sediment delivery ratio increases/decreases, and the sediment-borne nutrient content of the resulting sediment increases/decreases".

3. Why can't someone use the methods derived from Frere et al. (1980) to determine sediment-borne nutrient reduction for upland conservation practices?

Student Exercise 5. - Answers

1. Define the following terms:

   contributing area: *the portion of the priority field which contributes eroded soil to the water body.*

   sediment delivery ratio: *The fraction of eroded soil that will be deposited at the edge of the priority field.*

   nutrient enrichment: *The increase in sediment-borne nutrients during sediment delivery.*

2. Circle the correct choices:

   "As the size of the contributing area increases, the sediment delivery ratio increases/***decreases***, and the sediment-borne nutrient content of the resulting sediment ***increases***/decreases".

3. Why can't someone use the methods derived from Frere et al. (1980) to determine sediment-borne nutrient reduction for upland conservation practices?

   As soil moves across a land surface and sediment delivery decreases, nutrient enrichment takes place, and the values for nutrient content of soil derived from Frere et al. (1980) (0.0005 lbP/lb soil and 0.001 pbN/lb soil) cannot be used.

Sediment Reduction:

Sediment reduced (T/yr) = (B-A) x DR x CA

where **B** = sheet and rill erosion before treatment (T/ac/yr)
A = sheet and rill erosion after treatment (T/ac/yr)
DR = delivery ratio (a unitless fraction)
CA = contributing area (acres)

There are four steps to calculating the sediment reductions from upland conservation practices.

Step 1:
Calculate the priority field's soil being protected from sheet and rill erosion in tons per acre per year. Section I of the Field Office Technical Guide instructs the technician on how to calculate water erosion using the Revised Universal Soil Loss Equation (RUSLE) for the priority field(s). These computations can be reported as "Before" soil loss ("B"), the erosion in tons per acre per year before the conservation practice(s); and the "After" soil loss ("A"), the erosion in tons per acre per year after the conservation practice(s). The differences between "B" and "A" is the reduction in soil loss in tons per acre per year as a result of installing conservation practices.

Step 2:
Using professional judgement, determine the contributing area (CA) in acres.

Step 3:
Using Figure 4, estimate the delivery ratio from the size of the contributing area. For example, a 14- acre contributing area would have a delivery ratio of 0.68.

Step 4:
Calculate sediment reduced using the equation, **(B-A) x DR x CA**

Nutrient Reduction:

Step 1:
Using Exhibit 2, classify the predominant soil texture from the soil texture triangle illustration. Exhibit 2 groups the various mineral soil classification textures into three families: clay, silt and sand. For example, a loamy clay would be classified as a Clay.

Step 2:
Calculate the sediment-borne phosphorus and nitrogen using Figure 5. To utilize this graph properly, sediment delivery reductions are calculated per acre and then the corresponding nutrient reduction is multiplied by the contributing area. First the "Before" soil loss (B) and the "After" soil loss (A) are individually multiplied by the delivery ratio to calculate the tons of sediment delivered per acre per year. Then using Figure 5, the pounds per acre of nutrients are determined. Next the pounds per acre of nutrients are multiplied by the contributing area for the "B" situation and the "A" situation. Finally, the difference between the product of "B" and "A" is the reduction in nutrient.

Example:
A farmer applied no-till to a 40- acre field directly adjacent to a stream. The soil is a clay loam, the "Before" soil loss is 10 t/ac/yr., and the "After" soil loss is 1 t/ac/yr. The technician determines that the size of the contributing area is 25 acres. Calculate the sediment and sediment-borne phosphorus and nitrogen reduced from upland treatment of sheet and rill erosion.

Sediment Reduction:

Steps 1 and 2 are provided to the reader. B = 10 t/ac/yr. and A = 1 t/ac/yr.; and the contributing area (CA) = 25 acres. Using Figure 4, a CA of 25 acres gives a delivery ratio (DR) of approximately 0.63

Reduction in Sediment Delivery = (B-A) x DR x CA
= (10 - 1) x 0.63 x 25
= 141.75 t/yr. Round to 142 t/yr.

Phosphorus Reduction:

a. "Before" sediment delivery (t/ac/yr) = DR x B
= 0.63 x 10
= 6.3 t/ac/yr. Round to 6 t/ac/yr

Using Exhibit 2, the clay loam is classified as a Clay.

b. From Figure 5, a sediment delivery of 6 t/ac/yr. has 7.71 lb/ac/yr. Attached phosphorus.

c. Total "Before" phosphorus = attached P (from Figure 5) x CA
= 7.71 lb/ac/yr x 25 ac.
= 192.75 lbs/yr

d. "After" sediment delivery (t/ac/yr) = DR x A
= 0.63 x 1.0 t/ac/yr
= 0.63 t/ac/yr. Round to 0.6 t/ac/yr

e. From Figure 5, 0.6 t/ac/yr sediment delivery has 1.22lb/ac attached phosphorus

f. Total "After" phosphorus = attached P (from Figure 5) x CA.
= 1.22 lb/ac/yr x 25 ac.
= 30.5 lb/yr

g. The reduction in phosphorus = 192.75 - 30.5 = 162.25 lb/yr Round to 162 lb P/yr

Nitrogen Reduction:

a. "Before" sediment delivery (t/ac/yr) = DR x B
= 0.63 x 10
= 6.3 t/ac/yr. Round to 6 t/ac/yr

Using Exhibit 2, the clay loam is classified as a Clay.

b. From Figure 5, a sediment delivery of 6 t/ac/yr has 15.42 lb/ac/yr attached nitrogen.
c. Total "Before" nitrogen = attached N (from Figure 5) x CA
= 15.42 lb/ac/yr25 ac.
= 385.5 lbs./yr

d. "After" sediment delivery (t/ac/yr) = DR x A
= 0.63 x 1.0 t/ac/yr
= 0.63 t/ac/yr. Round to 0.6 t/ac/yr

e. From Figure 5, 0.6 t/ac/yr sediment delivery has 2.44lb/ac/yr attached nitrogen.

f. Total "After" nitrogen = attached N (from Figure 5) x CA.
= 2.44 lb/ac/yr x 25 ac.
= 61 lb/yr

g. The reduction in nitrogen = 385.5 - 61 = 324.5 lb/yr Round to 325 lb N/yr.

Student Exercise 6.

A landowner begins using mulch till on an 80- acre cornfield. The erosion rate before residue management was 15 t/ac/yr, and the erosion rate after mulch till was 1.0 t/ac/yr. The soil type is a silty clay loam. Using field observations, the technician determines that the contributing area is only 30 acres. Calculate the sediment and phosphorus reduction from conversion to mulch till.

Student Exercise 6. - Answers

A landowner begins using mulch till on an 80- acre cornfield. The erosion rate before residue management was 15 t/ac/yr, and the erosion rate after mulch till was 1.0 t/ac/yr. The soil type is a silty clay loam. Using field observations, the technician determines that the contributing area is only 30 acres. Calculate the sediment and phosphorus reduction from conversion to mulch till.

Sediment Reduction:

Steps 1 and 2 are provided to the reader: B = 15 t/ac/yr, A = 1 t/ac/yr, and CA = 30 acres. Using Figure 4, a CA of 30 acres gives a delivery ratio (DR) of approximately 0.62

Reduction in Sediment Delivery = (B-A) x DR x CA
= (15 - 1) x 0.62 x 30
= 260.4 t/yr. Round to 260 t/yr.

Using Exhibit 2, the silty clay loam is classified as a Silt.

Phosphorus Reduction:

a. *"Before" sediment delivery (t/ac/yr) = DR x B*
= 0.62 x 15 t/ac/yr
= 9.3 t/ac/yr. Round to 9 t/ac/yr

b. *From Figure 5, a sediment delivery of 9 t/ac/yr has 9.27 lb/ac/yr attached phosphorus.*

c. *Total "Before" phosphorus = attached P (from Figure 5) x CA*
= 9.27 lb/ac/yr x 30 ac.
= 278.1 lbs/yr

d. *"After" sediment delivery (t/ac/yr) = DR x A*
= 0.62 x 1.0 t/ac/yr
= 0.62 t/ac/yr. Round to 0.6 t/ac/yr

e. *From Figure 5, 0.6 t/ac/yr sediment delivery has 1.06 lb/ac/yr attached phosphorus*

f. *Total "After" phosphorus = attached P (from Figure 5) x CA.*
= 1.06 lb/ac/yr x 30 ac.
= 31.8 lb/yr

g. *The reduction in phosphorus = 278.1 - 31.8 = 246.3 lb/yr Round to 246 lb P/yr*

V. Filter Strips

Many watershed projects have filter strip programs. Filter strips further reduce the sediment and nutrient loads delivered to the surface water from upland sources. **The relative gross effectiveness of filter strips for sediment reduction is 65%; for phosphorus is 75%; and for nitrogen is 70%** (Pennsylvania State University, 1992).

Sediment Reduction
To calculate the added reduction of sediment, the "after" soil loss (A) is adjusted to reflect the added 65% reduction. For example, if A without a filter strip is 1 ton/ac/yr, inclusion of a filter strip would reduce sediment delivery to 0.35 ton/ac/yr (0.35 x 1). In other words, if 65% sediment reduction takes place, then 35% is left, which is expressed as a fraction (0.35). The resulting reduction in sediment [(B-A) x DR x CA] is the combined sediment reduction from both the filter strip and upland treatment.

Example:
Farmer Brown adopted no-till and reduced sediment delivery by 86 t/yr, phosphorus by 103 lb. and nitrogen by 205 lb. B = 10 t/ac/yr., and A = 1 t/ac/yr. Soil type is clay loam. CA = 14 acres. If Farmer Brown installs filter strips along Clear Creek along with the no-till, what would be the reduction in sediment and nutrients?

Sediment Reduction

= [tons Before – (fraction delivered to stream x tons After)] x DR x CA

= (10 - (0.35 x 1)) x 0.68 x 14

= 91.8 t/yr. Round to 92 t/yr

The 92 t/yr is the reduction in sediment load from the filter strip and no-till combined. To calculate the reduction in sediment from the filter strip alone:
92t/yr – 86t/yr = 6 t/yr.

Nutrient Reduction

To calculate the additional reduction in nutrients (phosphorus and nitrogen), the "After" soil loss (A) is adjusted to reflect the additional reduction of 75% for phosphorus and of 70% for nitrogen. For example, the "after" soil loss for phosphorus for the combined filter strip and upland treatment would be 0.25 multiplied by the original (upland treatment only) "after" soil loss. The "after" soil loss for nitrogen from both a filter strip and upland treatment would be 0.30 multiplied by the original "after" soil loss. Calculation of the "Before" soil loss (B) is the same as for other upland erosion treatments. The "After" soil loss (A) is adjusted as shown in the example below. The difference between the product of "B" and "A" is the combined reduction in nutrient from the filter strip and upland treatment.

Phosphorus Reduction:

a. "Before" soil loss:
0.68 x 10 t/ac/yr. = 6.8 t/ac/yr; Round to 7 t/ac/yr

Using Exhibit 2, the clay loam is classified as a Clay.

b. From Figure 5: 7 t/ac/yr delivers 8.72 lb/ac/yr attached P

c. "Before" phosphorus is 8.72 lb/ac/yr x 14 ac. = 122 lbs./yr

d. "After" soil loss:
0.68 x (0.25 x 1t/ac/yr) = 0.17 t/ac/yr; Round to 0.2 t/ac/yr

e. From Figure 5: 0.2 t/ac/yr sediment delivers 0.5 lb/ac/yr attached P

f. "After" phosphorus is: 0.5 lb/ac/yr x 14 ac. = 2.8 lbs./yr; Round to 3 lbs./yr

g,. The difference between the "Before" and "After" is the reduction in phosphorus from both the filter strip and no-till, or: 122lb/yr - 3 lb/yr = 119 lbs. P/yr

The reduction in the phosphorus load by the filter strip alone:
119lbs/yr - 103 lbs/yr = 16 lbs/yr

Nitrogen Reduction:

a. "Before" soil loss:
0.68 x 10 t/ac/yr = 6.8 t/ac/yr; Round to 7 t/ac/yr

Using Exhibit 2, the clay loam is classified as a Clay.

b. From Figure 5: 7 t/ac/yr sediment delivers 17.44 lb/ac/yr nitrogen

c. "Before" nitrogen is: 17.44 lb/ac/yr x 14 ac. = 244 lbs./yr

d. "After" soil loss:
0.68 x (0.30 x 1 t/ac/yr) = 0.2 t/ac/yr

e. From Figure 5: 0.2 t/ac/yr sediment delivers 1.01 lb/ac/yr nitrogen

f. "After" nitrogen is: 1.01 lb/ac/yr x 14 ac. = 14 lbs./yr

g. The difference between the "Before" and "After" is the reduction in nitrogen from both the filter strip and no-till, or:
244 lb/yr. - 14 lb/yr = 230 lbs./yr.

The addition of the filter strip to the no-till reduces the nitrogen load by:
230lb/yr - 205 lb/yr = 25 lbs./yr.

Student Exercise 7.

The landowner from Student Exercise 6 installs a filter strip at the edge of the 80- acre cornfield along a county drain and continues to apply residue management in the cornfield. The erosion rate was 15 t/ac/yr, and the erosion rate after establishment of the filter strip and residue management was 1.0 t/ac/yr. The soil type is a silty clay loam. Using field observations, the technician determines that the contributing area is only 30 acres. Calculate the sediment and phosphorus reduction from the combined filter strip and upland treatment. What amount of sediment and phosphorus is due to the filter strip alone?

Student Exercise 7. - Answers

The landowner from Student Exercise 6 installs a filter strip at the edge of the 80- acre cornfield along a county drain and continues to apply residue management in the cornfield. The erosion rate was 15 t/ac/yr, and the erosion rate after establishment of the filter strip and residue management was 1.0 t/ac/yr. The soil type is a silty clay loam. Using field observations, the technician determines that the contributing area is only 30 acres. Calculate the sediment and phosphorus reduction from the combined filter strip and upland treatment. What amount of sediment and phosphorus is due to the filter strip alone?

Sediment Reduction (residue management plus filter strip):

Steps 1 and 2 are provided to the reader: B = 15 t/ac/yr, A = 1 t/ac/yr, and CA = 30 acres. Using Figure 4, a CA of 30 acres gives a delivery ratio (DR) of approximately 0.62. The reductions of sediment from residue management is 260 t/yr., and 246 lb/yr. Phosphorus (answer to Student Exercise 6).

Sediment reduced = (15 - (0.35 x 1)) x 0.62 x 30
= 272.49 t/yr. Round to 272.

The amount of sediment reduced from the filter strip alone is 272 t/yr – 260 t/yr = 12 t/yr.

Phosphorus Reduction (residue management plus filter strip):

a. "Before" soil loss:
0.62 x 15 t/ac/yr. = 9.3 t/ac/yr; Round to 9 t/ac/yr

Using Exhibit 2, the clay loam is classified as a Clay.

b. From Figure 5: 9 t/ac/yr delivers 10.7 lb/ac/yr attached P

c. "Before" phosphorus is 10.7 lb/ac/yr x 30 ac. = 321 lbs./yr.

d. "After" soil loss:
0.62 x (0.25 x 1t/ac/yr) = 0.15 t/ac/yr; Round to 0.2 t/ac/yr

e. From Figure 5: 0.2 t/ac/yr sediment delivers 0.5 lb/ac attached P

f. "After" phosphorus is: 0.5 lb/ac/yr x 30 ac. = 15 lbs./yr

g,. The difference between the "Before" and "After" is the reduction in phosphorus from both the filter strip and no-till, or: 321lb/yr - 15 lb/yr. = 306 lbs./yr.

The reduction in the phosphorus load by the filter strip: 306lbs/yr. - 246 lbs/yr. = 60 lbs/yr.

FEEDLOT POLLUTION REDUCTION

An animal lot refers to an open lot or combination of open lots intended for confined feeding, breeding, raising or holding animals. It is specifically designed as a confinement area in which manure accumulates or where the concentration of animals is such that vegetation cannot be maintained.

Runoff from feedlots contains many agents that can be considered potential pollutants, including disease carrying organisms, organic matter, nutrients and suspended inorganic solids. These agents affect receiving waters by increasing the nutrient and suspended solid concentration, decreasing dissolved oxygen content of water, and in some cases, even threaten human and animal health. For nonpoint source watershed project progress reporting, we have selected chemical oxygen demand (COD) and phosphorus (P) as representative pollutant indicators to represent pollutant reduction.

Chemical Oxygen Demand (COD) is a measure of the amount of oxygen required to oxidize organic and oxidizable inorganic compounds in water. It can be used as a lumped parameter that reasonably appears to represent the degree of pollution in effluent. Phosphorus (P) is found in animal manure and is a major contributor to eutrophication of surface waters and is therefore an important pollutant indicator.

The purpose of these calculations is to represent the COD and P reductions after an animal waste system is installed. This method has two assumptions: 1) the feedlot is adjacent to a receiving hydrologic system without any buffering areas; and 2) installing the animal waste system will prevent any further pollutants from the lot from reaching the hydrologic system. Therefore the mass load of the COD and P calculated for the before situation will be the reduction in pollutants.

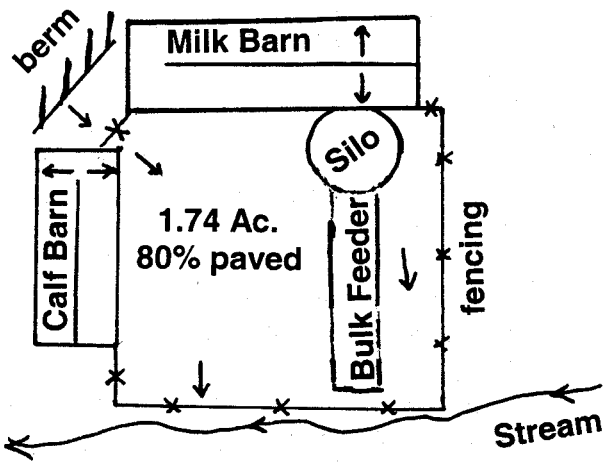
There may be feedlot sites where small buffers between the feedlot and waterbody already exist. Each of these situations should be handled individually with NPS Staff assistance. Feedlots that cannot show impact to the hydrologic system being protected should not be evaluated with this computation. An example of this would be a feedlot that does not have runoff reaching the hydrologic system, but is receiving technical assistance in order that waste utilization can be applied at agronomic rates. In this case, the impact would be reported using the ICM report for priority fields.

There are 12 steps involved in this calculation process. Use the worksheet given as Exhibit 3 in the Appendix as we go through the following example.

Example: Farmer Brown milks 70 dairy cows and has 30 replacement cows and 30 young stock. All the animals are confined in 80% paved feedlot. The feedlot is adjacent to Clear Creek and discharges into it. Determine the reduction in COD and P for the feedlot after the Waste Management System is installed.

Figure 6. Sample Feedlot

(Arrows indicate direction of runoff flow)



The following steps will calculate the COD and P loading reductions for installation of the Waste Management System.

Step 1: Carefully study the animal lot before the installation of the Waste Management System. Briefly describe the discharge point(s) using the name of the receiving water. All calculations will be based on feedlot situation before any improvements were made.

Step 2: On the back of the worksheet, sketch the feedlot. (Figure 6 gives a sketch of Farmer Brown's feedlot.) From field measurements determine the perimeter dimensions of the area contributing polluted water to the discharge point(s). This is the **contributing area (CA).** If the lot was partly paved and partly earthen, determine the proportion of the total that is paved.

Contributing Area (CA) = 75,620 ft^2 X 1 ac/43560 ft^2 = 1.74 ac

Percent paved = 80%

Step 3: Determine the **design rainfall (R)** from the rainfall map, Figure 7, for a 25-year, 24-hour rainfall. Federal regulations governing discharge of surface runoff from animal lots require 25-year, 24-hour storm events. This is consistent with NRCS standards and specifications.

R = 4.0 inches

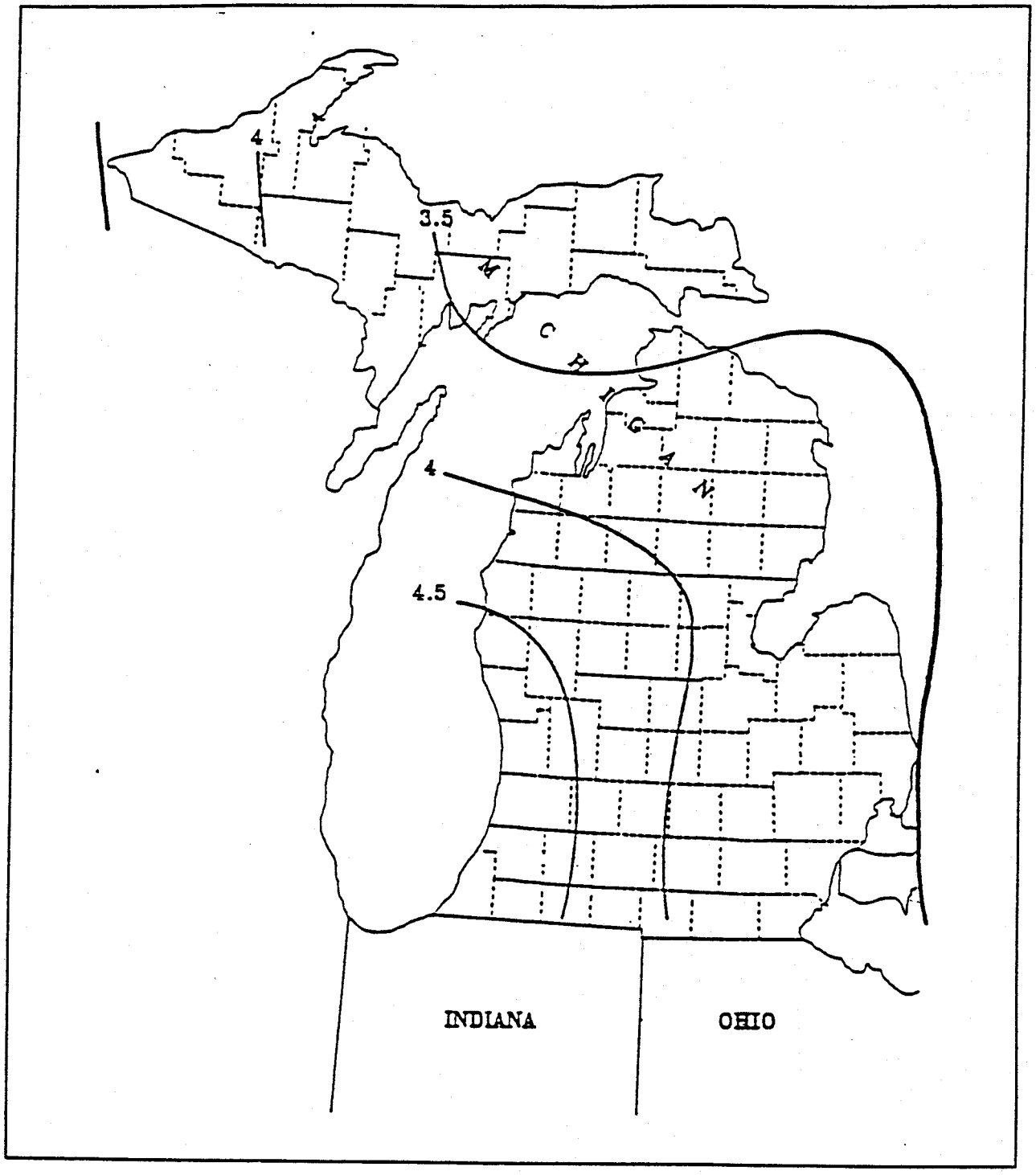
Step 4: Determine the **soil cover complex number (CN)** for the feedlot based on Figure 8.

Figure 8. Curve Numbers for Feedlots

Percent Paved	0 – 24%	25 – 49%	50 – 74%	75 – 100%
CN	91	92	93	94

In this example, CN = 94

Figure 7. 25-Year, 24-Hour Rainfall for Michigan.



Source: MDNR, 1992.

Step 5: Enter the number of animals in the lot and the animal type factors from Figure 9 for the COD and P. Animal types, number and weights utilized in this step should be consistent with those used in the design for the animal waste storage system. Interpolation of values should be based on the maximum weight animals would be expected to reach.

Animal Type

Dairy Cow	Number of Animals = 100 COD factor = 1.96 P factor = 0.92	Young Dairy	Number of Animals = 30 COD factor = 0.70 P factor = 0.33

Figure 9. Ratio of Chemical Oxygen Demand (COD) and total phosphorus (P) produced by various animals to that produced by a 1,000 pound slaughter steer.

Animal Type	Design Weight[1]	COD Ratio	P Ratio
	Pounds		
Slaughter Steer	1,000	1.00	1.00
Young Beef	500	.50	.51
Dairy Cow	1,400	1.96	.92
Young Dairy Stock	500	.70	.33
Swine	200	.17	.27
Feeder Pig	50	.04	.07
Sheep	100	.18	.06
Turkey	10	.02	.03
Chicken	4	.01	.01
Duck	4	.01	.01
Horse	1,000	.42	.42

Step 6: Calculate the runoff using the following equations:

$$\mathbf{S = \frac{1000}{CN} - 10} \qquad \mathbf{Q = \frac{(R-0.2S)^2}{R + 0.8S}}$$

where **S** = an empirical model coefficient
CN = soil cover complex number (Step 4)
R = design rainfall in inches (Step 3)
Q = runoff in inches

$$S = \frac{1000}{94} - 10 \qquad Q = \frac{[4.0 - 0.2(0.6383)]^2}{4.0 + 0.8(.0.6383)}$$

$$S = 0.6383 \qquad Q = 3.32 \text{ in.}$$

Step 7: Calculate the **runoff volume (V)** using the following equation:

V = Q x CA

where **V** = runoff volume in acre-inches
Q = runoff in inches (Step 6)
CA = contributing area in acres (Step 2)

V = 3.32 x 1.74 = 5.78 acre-in.

Step 8: Because animal species differ in their relative production of wastes, this step equates amount of waste to the standard 1000 lb. feeder steer. Thus the amount of pollutant produced by a beef animal is represented as one, with the amount produced by all other animals being a fraction relative to that. Calculate the **equivalent animal unit (EAU)** for COD and P using information from Step 5 in the following equation:

No. x Factor = EAU

where **No.** = number of animals (Step 5)
Factor = ratio of COD and P produced (Step 5)

	Animal Type	No. of Animals	x	Factor	=	EAU
COD:	Dairy Cow	100	x	1.96	=	196.0
	Young Dairy	30	x	0.70	=	21.0
P:	Dairy Cow	100	x	0.92	=	92.0
	Young Dairy	30	x	0.33	=	9.9

Step 9: When animal density is high, such as in a confined feedlot, almost all of the rainfall and runoff in and from the lot comes in contact with animal waste before leaving the lot. When animal density is low, some runoff may escape contact with manure and thus not be contaminated. Calculate the **Animal Unit Density (AUD)** and **percent manure pack** using the following equations:

EAU / CA = AUD

where **EAU** = Equivalent Animal Units (step 8)
CA = contributing area (Step 2)

If AUD < 100, percent manure pack = AUD;
If AUD > 100, percent of manure pack = 100%.

The assumption is that AUDs greater than 100 have a pollutant concentration that reaches a maximum level independent of the number of animal units.

COD: 217.0 / 1.74 = 124.7 AUD; assume manure pack = 100%
P: 101.9 / 1.74 = 58.6 AUD; manure pack = 58.6%

Step 10: Calculate the **concentration of COD and P** in the feedlot runoff using the following equations:

Fraction of manure pack x Constant = concentration mg/l

where **Fraction of manure pack** = Step 9 /100
COD constant = 4500 mg/l
P constant = 85 mg/l

(The constants were developed from USDA-Agricultural Research Service ARM-NC-17, April 1982, based on 100% manure pack.)

COD: 1.00 x 4500 mg/l = 4500 mg/l
P: 0.586 x 85 mg/l = 49.8 mg/l

Step 11: Calculate the **mass load of pollutants in the runoff** using the equation:

Concentration x Volume x Conversion factor = Mass Load

where **concentration** = mg/l (Step 10)
Volume = acre-inches (Step 7)
Conversion factor = 0.227

COD: 4500 mg/l x 5.78 x..0.227 = 5904 lb.
P: 49.8 mg/l x 5.78 x 0.227 = 65.3 lb

Step 12: Report reductions in COD and P to the nearest whole number. Therefore, after the Waste Management System is installed and the feedlot runoff no longer enters the surface water, the reduction in COD is 5904 lbs., and the reduction in P is 65 lbs..

A blank copy of the Feedlot Pollutant Reduction Worksheet is given in the Appendix (Exhibit 3).

INTEGRATED CROP MANAGEMENT REPORTING FOR PESTICIDES, COMMERCIAL FERTILIZER, and MANURE UTILIZATION

Section 319 watershed projects are required to practice Integrated Crop Management (ICM) on all priority fields. The Water Quality Resource Management Plan (WQRMP) must include ICM as a required component for the landowner to be eligible for cost-share on other practices using 319 funds. The WQRMP should reference the ICM plan.

The goal of ICM is to improve the management practices used by the producer, to bring the level of management to another level for better water quality protection. For example, a producer who is not currently using soil tests on the priority fields would include soil testing in his/her ICM plan. A producer who is currently using soil tests to set yield goals could incorporate other nutrient management techniques such as nitrate testing, split application of fertilizer, or other practices to better manage nutrients. The Water Quality Resource Management Plan (WQRMP) must include ICM as a required practice for cost-share eligibility, and should reference the ICM plan.

An ICM plan should be prepared for priority fields, documenting the pest and nutrient management practices that the landowner is implementing on these fields. The ICM plan is to be customized to the individual farm plan for the watershed's targeted pollutants. For example, if the watershed is to reduce sediment and phosphorus from entering the stream, the ICM plan would specify what ICM practices the landowner is using to address phosphorus. An ICM plan would differ for a livestock producer, cash crop producer, or a fruit producer.

A livestock producer's ICM plan would emphasize manure utilization and fertilizer management. Pesticide management would not include time and effort consuming activities such as scouting. However, the WQRMP would reference Pesticide Management as requiring the farmer to follow pesticide label restrictions and directions.

A cash crop farmer's ICM plan would include both integrated pest and fertilizer management. Integrated Pest Management (IPM) would be planned and applied depending on the technician's overall workload and availability. The technician may delegate IPM planning and training to MSU Extension personnel or private consultants. Or the technician may organize IPM training for participants in the watershed as a method of applying pest management. (It should be noted that EPA rules prohibit the use of 319 funds to fund ICM practices. Incentive funds may be available through the USDA's Environmental Quality Incentives Program.)

A fruit producer's ICM plan would include both IPM and fertilizer management.

The format for ICM plans and documentation is not formalized in water quality projects. The documents should be understandable by the producers, so that they understand what practices are required and how they are carried out. Documentation in the WQRMP should be specific enough for a reviewer to assess what practices are being used, when they are scheduled for implementation, and that they have been applied properly to meet water quality goals. The MSU Extension service and private firms offer forms and computer programs for producing ICM plans.

Attempts to quantify water quality impacts of ICM have been largely ineffective. Progress reporting has largely been based on tracking the number and acres of ICM practices applied to priority fields. Attached is an example of an ICM quarterly summary report, to document ICM activities within the watershed project. Progress is cumulative for the entire project and is to be reported with quarterly reports. For example, if at the end of the first quarter the project had

three participants and added one participant in the second quarter, the project's current status is four participants. Therefore 1a of the Integrated Crop Management Quarterly Report for the Second Quarter would be 4 (Figures 10 and 11). The second and subsequent year progress is accumulated in the same manner. Progress is never double or triple counted on the same people or acres.

Some projects have found the Individual Farm ICM Quarterly Summary to be an effective means to keep records of priority fields. Each participant has an ICM record sheet so that the technician may track progress. This can be kept in the case file or in a separate notebook specific to 319 ICM.

A blank copy of the ICM Quarterly Report is given as Exhibit 4 in the Appendix.

Figure 10. First Quarter ICM Report.

(Progress reporting is cumulative to date for the project.)

Project: Clear Creek Quarter: April 1 – June 30

1.	Total number of participants with priority fields		
	a.	Participating in the watershed project	3
	b.	that have ICM plans	1
	c.	that have applied ICM fields	0
2.	Total amount of acres in priority fields		
	a.	planned for ICM	200
	b.	that have had ICM applied	0
3.	Total number of ICM plans requiring modification		0
4.	Total number of nutrient/pesticide applicators calibrated		
	a.	fertilizer	1
	b.	pesticide	1
	c.	manure	1
5.	Total amount of acres of irrigation scheduling		
	a.	planned for scheduling	0
	b.	that have had scheduling	0
6.	Total amount of acres of pest scouting		
	a.	planned for scouting	40
	b.	that have been scouted	0
7.	Total amount of acres of manure utilization		80
	a.	on priority fields	80
	b.	on non-priority fields	100
8.	Total amount of acres fertilized according to current soil tests on priority fields.		0

Figure 11. Second Quarterly ICM Report.

(Progress reporting is cumulative to date for the project.)

Project: Clear Creek Quarter: July 1 – September 31

1. Total number of participants with priority fields
   - a. Participating in the watershed project 4
   - b. that have ICM plans 3
   - c. that have applied ICM fields 0
2. Total amount of acres in priority fields
   - a. planned for ICM 320
   - b. that have had ICM applied 0
3. Total number of ICM plans requiring modification 0
4. Total number of nutrient/pesticide applicators calibrated
   - a. fertilizer 1
   - b. pesticide 1
   - c. manure 1
6. Total amount of acres of irrigation scheduling
   - a. planned for scheduling 0
   - b. that have had scheduling 0
6. Total amount of acres of pest scouting
   - a. planned for scouting 80
   - b. that have been scouted 0
7. Total amount of acres of manure utilization
   - a. on priority fields 160
   - b. on non-priority fields 200
9. Total amount of acres fertilized according to current soil tests on priority fields. 0

GLOSSARY

Best Management Practice (BMP): structural, vegetative or management conservation practices which reduce or prevent detachment, transport and delivery of nonpoint source pollutants to surface or ground waters.

Channel Erosion Equation (CEE): a formula to calculate the soil loss from streambank erosion, erosion from road stream crossings, or other similar types of erosion.

Contributing Area (CA): the portion of the priority field, which contributes eroded soil to the water body.

Erosion: the wearing away or disintegration of earth material by the physical forces of moving wind and water.

Gully Erosion Equation (GEE): a formula to calculate the soil loss from concentrated flow, gullies or other similar types of erosion

Integrated Crop Management (ICM): a system of pest and nutrient management practices that will minimize entry of nutrients, manure and/or pesticides to surface and ground water while optimizing crop and forage yields.

Integrated Pest Management (IPM): a system of chemical, physical and biological practices to control pests, that will minimize entry of pesticides to surface and ground water while optimizing crop and forage yields.

Lateral Recession Rate (LRR): the thickness of soil eroded from a bank surface (perpendicular to the face) in an average year, given in feet per year. Used in the Channel Erosion Equation.

Nutrient enrichment: the increase in sediment-borne nutrients during sediment delivery.

Priority field: cropland, pastureland or hayland that contribute runoff to adjacent hydrologic systems such as lakes, streams, ditches, wetlands and flood plains.

Revised Universal Soil Loss Equation (RUSLE): an erosion model predicting long-term, average annual soil loss resulting from raindrop splash and runoff from specific field slopes in specified cropping and management systems and from rangeland.

Riparian: of or pertaining to the edge of a water body

Sediment delivery: the amount or fraction of earth material that is actually delivered to a water body.

Sediment Delivery Ratio (DR): the fraction of eroded soil that will be deposited at the edge of the priority field. Used in equations to calculate sediment and nutrient reduction from upland BMPs.

Soil loss tolerance: a measure of the amount of soil that can be removed from a site before soil productivity onsite is affected.

Water Quality Resource Management Plan (WQRMP): a record of the BMPs chosen by the landowner, which will address the sources of pollutants.

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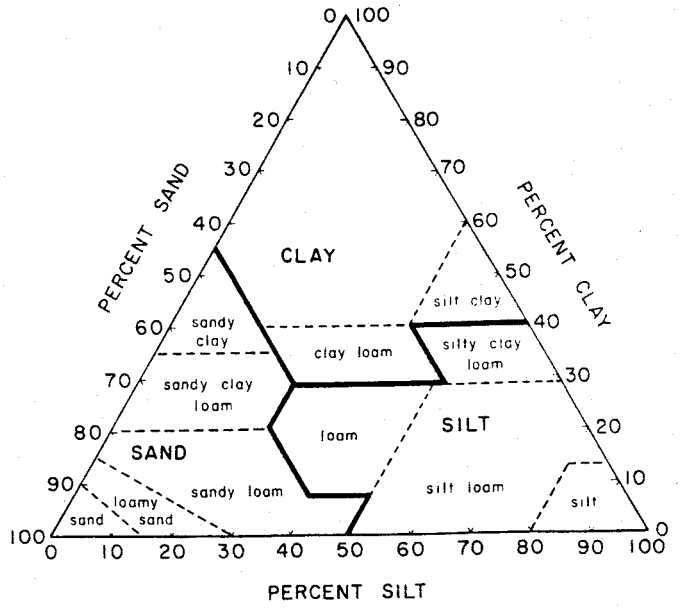
EXHIBITS

Exhibit 1
Dry Density Soil Weights

SOIL TEXTURAL CLASS	DRY DENSITY
	Tons/Ft3
Sands, loamy sands	.055
Sandy Loam	.0525
Fine sandy loam	.05
Loams, sandy clay loams, sandy clay	.045
Silt loam	.0425
Silty clay loam, silty clay	.04
Clay loam	.0375
Clay	.035
Organic	.011

Exhibit 2
Soil Texture Triangle



Correction Factors for Soil Texture

Soil Texture	Correction Factor
Clay	1.15
Silt	1.00
Sand	.85
Peat	1.50

Exhibit 3
Feedlot Pollution Reduction Worksheet

The following steps will calculate the COD and P reduction loadings for installation of the Waste Management System.

Step 1: Carefully study the animal lot before the installation of the Waste Management System. Briefly describe the discharge point(s) using the name of the receiving water. All calculations will be based on feedlot situation before any improvements were made.

Step 2: On the back of this form, sketch the feedlot. From field measurements determine the perimeter dimensions of the area contributing polluted water to the discharge point(s). This is the contributing area (CA). If the lot was partly paved and partly earthen, determine the proportion of the total that is paved.

Contributing Area (CA) = _____ ft^2 X 1 ac./43560 ft^2 = ____ acres
Percent Paved = ____

Step 3: Determine the design rainfall (R) from the rainfall map, Figure 1, for a 25-year, 24-hour rainfall. Figure 1 is at the end of this worksheet.

R = _____ inches

Step 4: Enter the soil cover complex number (CN) for the feedlot based on the following Table I.

Table I

Percent Paved	0 – 24%	25 – 49%	50 – 74%	75 – 100%
CN	91	92	93	94

CN = _____

Step 5: Enter the number of animals in the lot and the animal type factors from the Table II for chemical oxygen demand (COD) and total phosphorus (P).

Animal Type

_____ Number of Animals = _____
COD Factor = _____
P Factor = _____

_____ Number of Animals = _____
COD Factor = _____
P Factor = _____

_____ Number of Animals = _____
COD Factor = _____
P Factor = _____

Table II

Ratio of COD and P produced by various animals to that produced by a 1,000 pound slaughter steer.

Animal Type	Design Weight[1]	COD Ratio	P Ratio
	Pounds		
Slaughter Steer	1,000	1.00	1.00
Young Beef	500	.50	.51
Dairy Cow	1,400	1.96	.92
Young Dairy Stock	500	.70	.33
Swine	200	.17	.27
Feeder Pig	50	.04	.07
Sheep	100	.18	.06
Turkey	10	.02	.03
Chicken	4	.01	.01
Duck	4	.01	.01
Horse	1,000	.42	.42

[1]Interpolation of values should be based on the maximum weight animals would be expected to reach.

Step 6: Calculate the runoff using the following equations:

$$S = \frac{1000}{CN} - 10 \qquad Q = \frac{(R-0.2S)^2}{R + 0.8S}$$

Were S = an emp
CN = soil cover complex number (Step 4)
R = design rainfall in inches (Step 3)
Q = runoff in inches

Q = _____ inches

Step 7: Calculate the runoff volume (V) using the following equation:

V = Q X CA

Where V = runoff volume in acre-inches
Q = runoff in inches (Step 6)
CA = contributing area of acres (Step 2)

V = _____ X _____
V = _____ acre-in

Step 8: Calculate the equivalent animal units (EAU) for COD and P using information from Step 5 using the following equation:

No. X Factor = EAU

Where No. = Number of Animals (Step 5)
Factor = ratio of COD and P produced (Step 5)

	Animal Type	No. of Animals	x	Factor	=	EAU
COD:	_____	_____	x	_____	=	_____
	_____	_____	x	_____	=	_____
	_____	_____	x	_____	=	_____
				TOTAL	=	_____

Step 9: Calculate the Animal Unit Density (AUD) and % manure pack using the following equation:

EAU - CA = AUD

EAU = (Step 8)
CA = (Step 2)

COD: _____ - _____ = _____ AUD*

P: _____ - _____ = _____ AUD*

* If AUD < 100, percent manure pack = AUD
If AUD > 100, percent manure pack = 100%

Manure pack (COD) = _____%

Manure pack (P) = _____%

Step 10: Calculate the concentration of COD and P in the feedlot runoff using the following equations:

Fraction of manure pack x Constant = concentration mg/l

Fraction of manure pack = Step 9/100
COD Constant* = 4500 mg/l
P Content* = 85 mg/l

*Constants developed from USDA-Agricultural Research Service, ARM-NC-17 April 1982, based on 100% manure pack.

COD: _____ X 4500mg/l = _____mg/l

P: _____ X 85 mg/l = _____mg/l

Step11: Calculate the mass load of pollutants in the runoff using the following equation:

Concentration X Volume X Conversion Factor = Mass Load

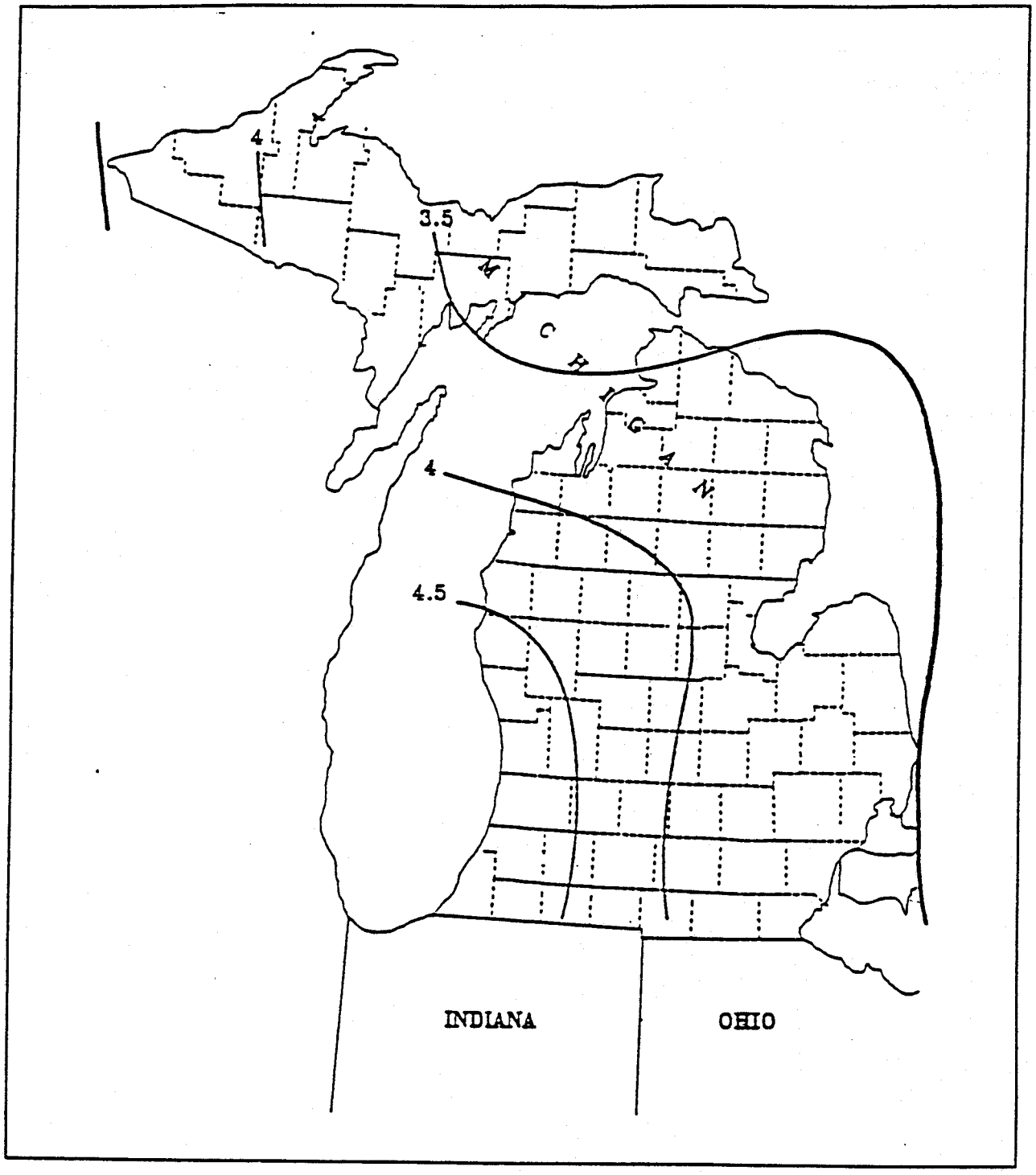
Concentration = mg/l (Step 10)
Volume = acre-inches (Step 7)

Conversion factor = 0.227

COD	_____	X	_____	X 0.227	=	_____	lb.
P	_____	X	_____	X 0.227	=	_____	lb.

Step 12: Therefore, after the Waste Management System is installed and the feedlot runoff no longer enters the surface water, the reduction in COD is _____ lbs. and the reduction in P is _____ lbs.

Figure 1. 25-Year, 24-Hour Rainfall for Michigan



Source: MDNR, 1992.

Exhibit 4
INTEGRATED CROP MANAGEMENT QUARTERLY SUMMARY REPORT

(Progress reporting is cumulative to date for the project.)

Project _____ Quarter _____

1) Total number of participants with priority fields

   a. Participating in the watershed project _____
   b. that have ICM plans _____
   c. that have applied ICM plans _____

2) Total amount of acres in priority fields

   a. planning for ICM _____
   b. that have had ICM applied _____

3) Total number of ICM plans requiring Modification _____

4) Total number of nutrient/pesticide applicators calibrated

   a. fertilizer
   b. pesticide
   c. manure

5) Total amount of acres of irrigation scheduling

   a. planned for scheduling _____
   b. that have had scheduling _____

6) Total amount of acres of pest scouting

   a. planned for scouting _____
   b. that have been scouted _____

7) Total amount of acres of manure utilization

   a. on priority fields _____
   b. on non-priority fields _____

8) Total amount of acres fertilized according to Current soil tests on priority fields -------

Exhibit 5
Load Reduction Estimating Workbook

A load reduction estimating workbook in Microsoft Excel® has been developed based on this document to provide a gross estimate of sediment and nutrient load reductions from the implementation of agricultural best management practices (BMPs). The methodology for the gross estimate of sediment and other constituent load reductions from the implementation of urban BMPs is based on reduction efficiencies and calculations developed by Illinois Environmental Protection Agency.

The original version (developed in 1999) of the load reduction estimating workbook was comprised of the following worksheets:

- Introductions
- Gully Stabilization
- Bank Stabilization
- Agricultural Fields and Filter Strips
- Feedlots
- Urban Runoff

A new worksheet—CountyData—was added to the workbook in 2002. The CountyData worksheet contains a collection of state and county names, precipitation data (annual amount and number of rain days) and correction factors (rainfall and number of rain days were adjusted to account for the runoff-producing events only), and USLE parameter values summarized from the 1997 National Resources Inventory database. Using the precipitation data and USLE parameter values, two of the original worksheets, Agricultural Fields and Filter Strips, and Feedlots, were modified.

Worksheet Modifications: Agricultural Fields and Filter Strips

- Users may choose a state and a county from the pull-down combo boxes in the worksheet to obtain the default county-level USLE parameter values. If the local USLE or RUSLE parameter values are available, users should input the local values in the worksheet instead of using the default values.

- Users may click-check either or both of the BMP boxes to obtain the load reduction results as follows:
    a. If the Agricultural Field Practices box is checked, the load reduction is calculated for the agricultural field practices only.
    b. If the Filter Strips box is checked, the load reduction is calculated for the filter strips only.
    c. If both boxes are checked, the load reduction is calculated for both the agricultural field practices and filter strips.

Worksheet Modifications: Feedlots

The fundamental methodology of this worksheet is based on the section of "Feedlot Pollution Reduction" in this document. However, the methodology was modified to calculate annual runoff and load through inclusion of precipitation data. In addition,

biochemical oxygen demand (BOD), phosphorus (P), and nitrogen (N) constants used in this worksheet were derived from EPA's Spreadsheet Tool for Estimating Pollutant Load (STEPL) model, developed by Tetra Tech, Inc. to enhance consistency between the methods.

- Users may select a state and a county to calculate the average runoff per rain day.

- Users may select a BMP to calculate the effect of BMP on load reduction.

Algorithm through an Example: Feedlots Worksheets

An animal lot refers to an open lot or combination of open lots intended for confined feeding, breeding, raising or holding animals. It is specifically designed as a confinement area in which manure accumulates or where the concentration of animals is such that vegetation cannot be maintained.

Runoff from feedlots contains many agents that can be considered potential pollutants including disease-carrying organisms, organic matter, nutrients and suspended inorganic solids. These agents affect receiving waters by increasing the nutrient and suspended solid concentration, decreasing dissolved oxygen content of water, and in some cases, threatening human and animal health. For nonpoint source watershed project progress reporting, we have selected BOD, N, and P as indicators to represent pollutant reduction.

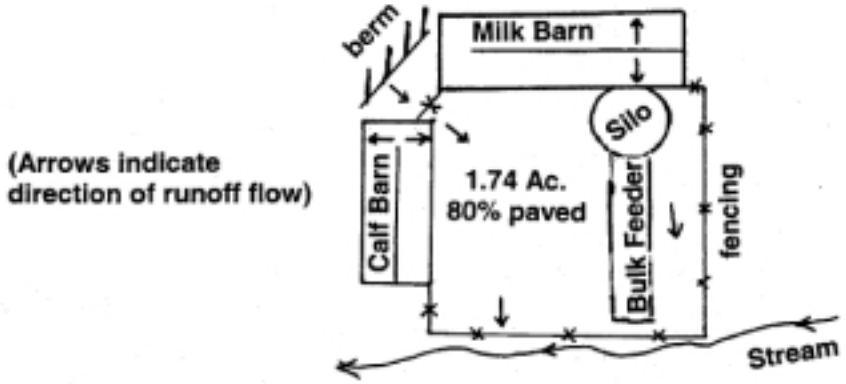
Biochemical oxygen demand is a measure of the amount of oxygen required to decompose organic matter by microorganisms such as bacteria. BOD in this section refers to BOD5—amount of oxygen required to decompose organic matter by microorganisms over a 5-day period. It can be used as a lumped parameter that reasonably appears to represent the degree of pollution in effluent. N and P are found in animal manure and are major contributors to eutrophication of surface waters and are therefore important pollutant indicators.

The purpose of these calculations is to represent the BOD, N, and P reductions after a BMP is implemented, or an animal waste system is installed. The effectiveness of each BMP or animal waste system can be represented by the pollutant-removal efficiency. Therefore the reduction in pollutants is calculated as the product of the BMP efficiencies and the mass load of the BOD, N, and P.

There are 14 steps involved in this calculation process. Below is an example that illustrates the calculation steps and algorithm.

Example: Farmer Brown milks 70 dairy cows and has 30 replacement cows and 30 young stock. All the animals are confined in 80 percent paved feedlot. The feedlot is adjacent to Clear Creek and discharges into it. Determine the reduction in BOD, N, and P for the feedlot after the installation of a Waste Management System.

Figure E5-1. Sample feedlot.



The following steps will calculate the BOD-, N-, and P- loading reductions for the implementation of the BMP.

Step 1: Carefully study the animal lot before the installation of the Waste Management System. Briefly describe the discharge point(s) using the name of the receiving water.

Step 2: On the back of the worksheet, sketch the feedlot. (Figure E5-1 gives a sketch of Farmer Brown's feedlot.) From field measurements determine the perimeter dimensions of the area contributing polluted water to the discharge point(s). This is the **contributing area (CA).** If the lot was partly paved and partly earthen, determine the proportion of the total that is paved.

CA = 75,620 ft^2 x 1 ac/43560 ft^2 = 1.74 ac
Percent paved = 80%

Step 3: Determine the **average rainfall (R) per day** by selecting the state and county in which the feedlot is located and the nearest weather station. R is calculated as:

$$\frac{\textbf{Annual rainfall x Precipitation correction factor}}{\textbf{Annual rain days x Correction factor for number of rain days}}$$

For example, select state of Michigan and Alcona County with the default weather station.

R = 0.2848 inches

Step 4: Determine the **soil cover complex number (CN)** for the feedlot based on Figure E5-2.

Figure E5-2. Curve Numbers for Feedlots

Percent Paved	0%–24%	25%–49%	50%–74%	75%–100%
CN	91	92	93	94

In this example, CN = 94

Step 5: Enter the number of animals in the lot and the animal type factors from Figure E5-3 for the BOD, N, and P. Animal types, number, and weights used in this step should be consistent with those used in the design for the animal waste storage system. Interpolation of values should be based on the maximum weight animals would be expected to reach.

Animal Type

Dairy Cow	Number of Animals = 100 BOD factor = 1.4 N factor = 1.91 P factor = 0.92	Young Dairy	Number of Animals = 30 BOD factor = 0.5 N factor = 0.55 P factor = 0.33

Figure E5-3. Ratio of BOD, total N, and total P produced by various animals to that produced by a 1,000 pound slaughter steer.

Animal Type	Design Weight (lbs)	BOD Ratio	N Ratio	P Ratio
Slaughter Steer	1,000	1.00	1.00	1.00
Young Beef	500	.50	.45	.51
Dairy Cow	1,400	1.4	1.91	.92
Young Dairy Stock	500	.5	.55	.33
Swine	200	.388	.25	.27
Feeder Pig	50	.097	.06	.07
Sheep	100	.075	.14	.06
Turkey	10	.013	.02	.03
Chicken	4	.008	.01	.01
Duck	4	.0011	.01	.01
Horse	1,000	1.063	.85	.42

Step 6: Calculate the runoff using the following equations:

$$\mathbf{S = \frac{1000}{CN} - 10} \qquad \mathbf{Q = \frac{(R-0.2S)^2}{R + 0.8S}}$$

where **S** = an empirical model coefficient
CN = soil cover complex number (Step 4)
R = design rainfall in inches (Step 3)
Q = runoff in inches

$$S = \frac{1000}{94} - 10 \qquad Q = \frac{[0.2848 - 0.2(0.6383)]^2}{0.2848 + 0.8(.0.6383)}$$

$$S = 0.6383 \qquad Q = 0.03103 \text{ in.}$$

Step 7: Calculate the **runoff volume (V)** using the following equation:

V = Q x CA

where **V** = runoff volume in acre-inches
Q = runoff in inches (Step 6)
CA = contributing area in acres (Step 2)

V = 0.2555 x 1.74 = 0.0540 acre-in.

Step 8: Because animal species differ in their relative production of wastes, this step equates amount of waste to the standard 1000 lb. feeder steer. Thus the amount of pollutant produced by a beef animal is represented as one, with the amount produced by all other animals being a fraction relative to that. Calculate the **equivalent animal unit (EAU)** for BOD, N, and P using information from Step 5 in the following equation:

No. x Factor = EAU

Where, **No.** = number of animals (Step 5)
Factor = ratio of BOD, N, and P produced (Step 5)

	Animal Type	No. of Animals	x	Factor	=	EAU
BOD:	Dairy Cow	100	x	1.4	=	140.0
	Young Dairy	30	x	0.5	=	15.0
N:	Dairy Cow	100	x	1.91	=	191.0
	Young Dairy	30	x	0.55	=	16.5
P:	Dairy Cow	100	x	0.92	=	92.0
	Young Dairy	30	x	0.33	=	9.9

Step 9: When animal density is high, such as in a confined feedlot, almost all of the rainfall and runoff in and from the lot comes in contact with animal waste before leaving the lot. When animal density is low, some runoff may escape contact with manure and thus not be contaminated. Calculate the **Animal Unit Density (AUD)** and **percent manure pack** using the following equations:

EAU / CA = AUD

Where: **EAU** = Equivalent Animal Units (step 8)
CA = contributing area (Step 2)

If AUD < 100, percent manure pack = AUD;
If AUD > 100, percent of manure pack = 100%.

The assumption is that AUDs greater than 100 have a pollutant concentration that reaches a maximum level independent of the number of animal units.

BOD: 155.0 /1.74 = 89.1 AUD; assume manure pack = 89.1%
N: 207.5 /1.74 = 119.3 AUD; assume manure pack = 100%
P: 101.9 /1.74 = 58.6 AUD; assume manure pack = 58.6%

Step 10: Calculate the **concentration of BOD, N, and P** in the feedlot runoff using the following equations:

Fraction of manure pack x Loading constant = Concentration mg/l

Where: **Fraction of manure pack** = Step 9 /100
BOD constant = 2000 mg/l
N constant = 1500 mg/l
P constant = 300 mg/l
(The constants were developed from the references provided at the end of this section.)

BOD: 0.89 x 200 mg/l = 1780 mg/l
N: 1.0 x 1500 mg/l = 1500 mg/l
P: 0.586 x 300 mg/l = 175.8 mg/l

Step 11: Calculate the **mass load of pollutants in the runoff** using the equation:

Concentration x Volume x Conversion factor = Mass Load

Where: **Concentration** = mg/l (Step 10)
Volume = acre-inches (Step 7)
Conversion factor = 0.227

BOD: 1780 mg/l x 0.054 x 0.227 = 21.84 lb.
N: 1500 mg/l x 0.054 x 0.227 = 18.39 lb.
P: 175.8 mg/l x 0.054 x 0.227 = 2.15 lb.

Step 12: Calculate the **annual average mass load** of pollutants in runoff using the following equation:

Annual average mass load = **Mass load x Rain days per year x Correction factor for number of rain days**

BOD: 21.84 lb x 117.1 x 0.6 = 1534.3 lb/yr
N: 18.39 lb x 117.1 x 0.6 = 1291.8 lb/yr
P: 2.15 lb x 117.1 x 0.6 = 151.3 lb/yr

Step 13: Select the BMP (for example: Waste Management System) (Figure E5-4), and calculate the load reduction:

Load reduction after BMP = Annual average mass load x BMP pollutant removal efficiency

BOD: 1534.3 lb/yr x no data (ND) = NA
N: 1291.8 lb/yr x 0.8 = 1033.4 lb/yr
P: 151.3 lb/yr x 0.9 = 136.2 lb/yr

Figure E5-4. Pollutant removal efficiency of selected feedlot-related BMP*.

Best Management Practices	Pollutant Removal Efficiency		
	N	P	BOD
No BMP	0	0	0
Diversion	0.45	0.7	ND
Filter Strips	ND	0.85	ND
Runoff Mgmt System	ND	0.825	ND
Terrace	0.55	0.85	ND
Waste Mgmt System	0.8	0.9	ND
Waste Storage Facility	0.65	0.6	ND
Solids Separation Basin	0.35	0.31	ND
Solids Separation Basin w/Infiltration Bed	ND	0.8	0.85

ND = No data.
* Values in the table were derived from the references listed at the end of this section.

Reductions in BOD, N, and P should be rounded to the nearest whole number. Therefore, after the installation of the Waste Management System, and the feedlot load reduction in N is 1033 lbs/yr and the reduction in P is 136 lbs/yr.

Step 14: Average annual pollutant load after installing the Waste Management System can be calculated as: **Load before BMP – Load reduction**

BOD: 1534.3 lb/yr - no data (ND) = NA
N: 1291.8 lb/yr - 1033.4 = 258 lb/yr
P: 151.3 lb/yr - 136.2 = 14 lb/yr

References

(Loading constant)

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4. U.S. Environmental Protection Agency (EPA). 1973. *Development document for proposed effluent limitation guidelines and new source performance standards for the feedlots point source category.* EPA-440-1-73-004. U.S. Environmental Protection Agency, Washington, DC.

(BMP efficiency)

5. DPRA, Inc. 1986. *An evaluation of the cost effectiveness of agricultural best management practices and publicly owned treatment works in controlling phosphorus*

pollution in the Great Lakes basin. Prepared for U.S. Environmental Protection Agency, Washington, DC.

6. Edwards, W.M., L.B. Owens, and R.K. White. 1983. Managing runoff from a small, paved beef feedlot. *J Environ Qual.* 12(2).

7. Edwards, W.M., L.B. Owens, R.K. White, and N.R. Fausey. 1986. Managing feedlot runoff with a settling basin plus tiled infiltration bed. *T ASAE.* 29(1):243-247.

8. U.S. Environmental Protection Agency (EPA). 1993. *Guidance specifying management measures for sources of nonpoint pollution in coastal waters.* EPA-840-B-92-002. Office of Water, U.S. Environmental Protection Agency, Washington, DC.

(STEPL)

9. Tetra Tech, Inc. 2002. *User's guide: Spreadsheet tool for the estimation of pollutant load (STEPL). Version 2.01.* Prepared for U.S. Environmental Protection Agency, Washington, DC.

Exhibit 6
Algorithm through an Example: Urban Runoff Worksheet

Urban runoff can be attributed to many things, including the amount of rainfall, the soil conditions, and the degree of urbanization. Urban areas usually have high percentages of hard, impermeable surfaces. Fields and forests allow for the rainwater to soak into the soil where it falls, but parking lots, roofs, streets, and other impervious surfaces of an urban environment cause the rainwater to collect, and it must be forced out through a storm drain system. If the drainage system does not connect to a wastewater treatment facility, the rainwater and everything in it travels into local streams and rivers.

Urban runoff contributes many pollutants to the nearby streams and lakes. Some of these pollutants are nitrogen, phosphorus, sediment, lead, zinc, copper, cadmium, chromium, and arsenic. In addition to contributing pollutants, urbanization affects other water quality characteristics. These characteristics include water temperature, pH, dissolved oxygen, alkalinity, hardness, and conductivity.

Implementing best management practices (BMPs) in urban areas can reduce the pollutants carried by runoff to the nearby steams and lakes. The following example illustrates how to calculate pollutant load from a hypothetical urban area and the load reduction after implementing a BMP.

Example: Determine the reduction in total nitrogen (TN) and total phosphorus (TP) loadings for an urban area (**contributing/drainage area**) after the implementation of vegetated filter strips.

We use the Load Reduction Estimating Workbook (see Exhibit 5) to illustrate the calculation steps.

The land use characteristics for the hypothetical area are as follows:

Land Use	Area with storm water sewers (acres)	Area without storm water sewers (acres)
Commercial	50	0
Transportation	5	2

Step 1: Select a best management practice you want to implement in the contributing/drainage area.

Select the first option from the BMP list: Vegetated filter strips.

Step 2: Estimate the area in acres with and without storm water sewers for every land use type in the contributing/drainage area.

Commercial area with storm water sewers = 50 acres
Transportation area with storm water sewers = 5 acres
Transportation area without storm water sewers = 2 acres

Step 3: Calculate the **load before BMP** implementation for TN and TP in the contributing/drainage area.

Load before BMP =
Average pollutant loading rates by land use x Area by land use

Average pollutant loading rates by land uses are obtained from Figure E6-1.

Hence, the loads before BMP implementation are:

TN = 21 lb/ac/yr x 50 ac (Commercial sewered) +
13 lb/ac/yr x 5 ac (Transportation sewered) +
7.7 lb/ac/yr x 2 ac (Transportation unsewered) = 1,130.4 lb/yr

TP = 1.3 lb/ac/yr x 50 ac (Commercial sewered) +
1.8 lb/ac/yr x 5 ac (Transportation sewered) +
1.1 lb/ac/yr x 2 ac (Transportation unsewered) = 76.2 lb/yr

Figure E6-1. Average Pollutant Loading Rates by Urban Land Use Types (lb/ac/yr) *

Land Use**	Com-mercial	Industrial	Institu-tional	Trans-portation	Multi-Family	Resi-dential	Agri-culture	Vacant	Open Space
BOD (Sewered)	85	50	52	50	52	22		2	1
BOD (Unsewered)	75	40	31	30	42	11	3	0.9	0.4
COD (Sewered)	589	260	320	881	320	140		64	46
COD (Unsewered)	520	230	190	518	260	71	28	26	15
TSS (Sewered)	1180	1240	1320	2260	1320	309		100	61
TSS (Unsewered)	1040	1080	790	1330	1050	154	153	40	20
TN (Sewered)	1.03	1.58	0.37	2.67	0.37	0.23		0.03	0.02
TN (Unsewered)	0.90	1.39	0.22	1.57	0.29	0.12	0.00	0.01	0.01
COPPER (Sewered)	0.2	0.21	0.1	0.56	0.1	0		0.01	0.01
COPPER (Unsewered)	0.18	0.18	0.061	0.33	0.08	0	0.0044	0.004	0.002
TP (Sewered)	1.6	1.3	0.57	3.2	0.57	0.9		0.1	0.08
TP (Unsewered)	1.4	1.2	0.34	1.9	0.46	0.5	0.069	0.06	0.03
TDS (Sewered)	2830	1290	623	6060	623	436		1210	724
TDS (Unsewered)	2500	1130	374	3565	498	218	89.2	483	241
TN (Sewered)	21	14	11	13	11	6		1	1
TN (Unsewered)	18	12	6.5	7.7	8.6	3.1	2.4	0.5	0.2
TKN (Sewered)	6.9	4	6.4	18	6.4	3.2		2.2	1.3
TKN (Unsewered)	6.1	4	3.8	11	5.1	1.6	0.91	0.88	0.44
DP (Sewered)	0.69	0.86	0.61	0.2	0.61	0.3		0.1	0.08
DP (Unsewered)	0.61	0.75	0.36	0.1	0.48	0.1	0.08	0.05	0.03
TP (Sewered)	1.3	1.5	1.4	1.8	1.4	0.8		0.22	0.39
TP (Unsewered)	1.2	1.3	0.8	1.1	1.1	0.4	0.18	0.088	0.13
CADMIUM (Sewered)	0.008	0.03	0.0037	0.021	0	0		0.0003	0.0002
CADMIUM (Unsewered)	0.0071	0.02	0.0022	0.012	0	0	0.0002	0.0001	0.0001

* Northeastern Illinois Planning Commission. 1983. Unit area pollutant load estimates for Lake County, Illinois Lake Michigan watersheds.
**Sewered or unsewered refer to the urban areas with or without storm sewers.

Step 4: Calculate the **load after BMP** implementation.

Load after BMP = Load before BMP x (1 - BMP pollutant removal efficiency)

BMP pollutant removal efficiencies (vegetated filter strips) for TN and TP pollutants are obtained from Figure E6-2.

Hence, the loads after BMP implementation are:

TN = 1130.4 lbs/yr x (1 - 0.4) = 678.24 lb/yr
TP = 76.2 lbs/yr x (1 - 0.4525) = 41.7195 lb/yr

Figure E6-2. BMP Pollutant Removal Efficiencies (Maximum Efficiency = 1)

BMP Types	Ref*	BOD	COD	TSS	LEAD	COPPER	ZINC	TDS	TN	TKN	DP	TP	CADMIUM
Vegetated Filter Strips	A&B	0.505	0.4	0.73	0.45	U	0.6	U	0.4	U	U	0.4525	U
Grass Swales	A,B&C	0.3	0.25	0.65	0.7	0.5	0.6	U	0.1	U	U	0.25	0.5
Infiltration Devises	A	0.83	U	0.94	U	U	U	U	U	U	U	0.83	U
Extended Wet Detention	A&B	0.72	U	0.86	0.4	U	0.2	U	0.55	U	U	0.685	U
Wetland Detention	A&B	0.63	0.5	0.78	0.65	U	0.35	U	0.2	U	U	0.44	U
Dry Detention	A&B	0.27	0.2	0.58	0.5	U	0.2	U	0.3	U	U	0.26	U
Settling Basin	A	0.56	U	0.82	U	U	U	U	U	U	U	0.515	U
Sand Filters	A	0.4	U	0.83	U	U	U	U	U	U	U	0.375	U
WQ Inlets	A&B	0.13	0.05	0.37	0.15	U	0.05	U	0.2	U	U	0.09	U
Weekly Street Sweeping	A	0.06	U	0.16	U	U	U	U	U	U	U	0.06	U
Infiltration Basin	B&D	U	0.65	0.75	0.65	U	0.65	U	0.6	U	U	0.65	U
Infiltration Trench	B&D	U	0.65	0.75	0.65	U	0.65	U	0.55	U	U	0.6	U
Porous Pavement	B	U	0.8	0.9	1	U	1	U	0.85	U	U	0.65	U
Concrete Grid Pavement	B	U	0.9	0.9	0.9	U	0.9	U	0.9	U	U	0.9	U
Sand Filter/Infiltration Basin	B	U	0.55	0.8	0.6	U	0.65	U	0.35	U	U	0.5	U
WQ Inlet w/ Sand Filter	B	U	0.55	0.8	0.8	U	0.65	U	0.35	U	U	U	U
Oil/Grit Separator	B	U	0.05	0.15	0.15	U	0.05	U	0.05	U	U	0.05	U
Wet Pond	B	U	0.4	0.6	0.75	U	0.6	U	0.35	U	U	0.45	U
Agriculture Filter Strip	C	U	U	U	U	U	U	U	0.5325	U	U	0.6125	U

U = Data unavailable

* References:

A Northeastern Illinois Planning Commission (NIPC). 1994. Model best management practice selection methodology & Lake County decision-making framework. NIPC, Chicago, Illinois.

B U.S. Environmental Protection Agency (EPA). 1993. Guidance specifying management measures for sources of nonpoint pollution in coastal waters. EPA-840-B-92-002. Office of Water, Washington, DC. <http://www.epa.gov/OWOW/NPS/MMGI/Chapter4/index.html>.

C Leeds, R., L.C. Brown, M.R. Sulc, and L.VanLieshout. 1994. Vegetative filter strips: Application, installation and maintenance. AEX-467-94. Ohio State University Extension, Columbus, Ohio. <http://ohioline.osu.edu/aex-fact/0467.html>.
Note: Took middle value of ranges for conflicting results

D Athayde, D.N., P.E. Shelly, E.D. Driscoll, D. Gaboury, and G. Boyd. 1983. Results of the nationwide urban runoff program. Volume I–final report. U.S. Environmental Protection Agency, Washington DC. 186 pages.

E Schueler, T.R. 1987. Controlling urban runoff: A practical manual for planning and designing urban BMPs. Metropolitan Washington Council of Governments, Washington, DC.

Step 5: Calculate the **load reduction** after the BMP implementation.

Load reduction = Load before BMP – Load after BMP

TN Reduction: 1,130.4 – 678.24 = 452.16 lb/yr
TP Reduction: 76.2 – 41.72 = 34.48 lb/yr

Attachment 6 Pollutant Load Reduction

Project No.	Model Used	Project	Comments	Drainage Areas	Pollutant	Current	Cumulative	Units
Project 03-03	Region 5	1	Clean Marina - Use urban BMP of street sweeping to reflect "good housekeeping" on an average of 2.8 unsewered commercial acres per marina. Simply get the number of new certified members each year. 3 additional marinas in FY04 for 32 to date.	5	Sediment	0.7	7.5	tons/yr
					Phosphorus	1	6	lbs/yr
Project 04-02	Region 5	Agricultural	Agricultural Projects to reduce N and P by better farm management programs. Used AG field practices but only accounted for N and P reductions. Used Litchfield County although activities are statewide. Used silt soil and reduced USLE by 50% for support practices. Acreage will grow each year, assuming all management practices continue year after year. 8392 acres.	5	Nitrogen	26339	26339	lbs/yr
					Phosphorus	13108	13108	lbs/yr
Project 04-13 Southwest	Region 5	1- Agricultural	Assume that their assistance includes both AG Field practices and filter strip type actions, so check both boxes. Select appropriate state and county (Fairfield Co.). Silt soils. The USLE is reduced by 50% as default. Acreage will grow each year, assuming all management practices continue year after year. 530 acres	1	Sediment	1170	1893	tons/yr
		1- Agricultural			Nitrogen	3158	5370	lbs/yr
		1- Agricultural			Phosphorus	1586	2714	lbs/yr
		3 - Urban BMP	Urban/suburban activities for developed land ONLY and WQ inlet BMP. These will be cumulative over the years. Sewered/unsewered acres = Commercial 186/96.5; Industrial 102/21; Residential 332/1014.5	1	Sediment	135	211	tons/yr
		3 - Urban BMP			Nitrogen	2492	3928	lbs/yr
		3 - Urban BMP			Phosphorus	109	171	lbs/yr

Project 04-13 Northwest	Region 5	Urban BMP	Urban/suburban activities for developed land ONLY and WQ inlet BMP. These will be cumulative over the years. Sewered/unsewered acres = Commercial 52/0; Industrial 35/0; Transportation 0/4; Multi family 278/0; Residential 187/689	1	Sediment	119	212	tons/yr
					Nitrogen	1586	3182	lbs/yr
					Phosphorus	85	150	lbs/yr
Project 04-13 CT River Coastal	Region 5	Urban BMP	Urban/suburban activities for developed land ONLY and WQ inlet BMP. These will be cumulative over the years. Sewered/unsewered areas = Commercial 16/20; Industrial 0/243; Institutional 256/79; Residential 85/1265	1	Sediment	171	229	tons/yr
					Nitrogen	2275	3194	lbs/yr
					Phosphorus	122	170	lbs/yr
Project 04-13 Eastern	Region 5	1 - Agricultural	Assume that their assistance includes both AG Field practices and filter strip type actions, so check both boxes. Select appropriate state and county. The USLE is reduced by 50% as default. Acreage will grow each year, assuming all management practices continue year after year. 2300 acres.	1	Sediment	2626	3461	tons/yr
		1 - Agricultural			Nitrogen	8089	10571	lbs/yr
		1 - Agricultural			Phosphorus	4063	5329	lbs/yr
		2 - Urban BMP	Urban/suburban activities for developed land ONLY and WQ inlet BMP. These will be cumulative over the years. Sewered/unsewered areas = Commercial 350/50; Industrial 0/100; Residential 330/960	1	Sediment	152	495	tons/yr
					Nitrogen	2881	9513	lbs/yr
					Phosphorus	117	349	lbs/yr
Project 04-13 Northcentral	Region 5	1 - Agricultural	Assume that their assistance includes both AG Field practices and filter strip type actions, so check both boxes. Select appropriate state and county. The USLE is reduced by 50% as default. Acreage will grow each year, assuming all management practices continue year after year. acres.	1	Sediment	2905	4596	tons/yr
		1 - Agricultural			Nitrogen	8035	12640	lbs/yr

		1 - Agricultural			Phosphorus	4034	6346	lbs/yr
		2 - Urban BMP	Urban/suburban activities for developed land ONLY and WQ inlet BMP. These will be cumulative over the years. Sewered/unsewered areas = Commercial 0/0; Residential 0/0	1	Sediment	91	148	tons/yr
					Nitrogen	1831	3005	lbs/yr
					Phosphorus	71	124	lbs/yr
Project 04-18	Region 5	Streambank Stabilization	Mattabesset River Watershed Action Plan stream bank stabilization in Willow Brook, Cromwell. Used defaults. Bank length 500 ft, one bank, height 1 ft, recession 0.05 ft/yr. Loams.	1	Sediment	1.1	1.1	tons/yr
					Nitrogen	1.9	1.9	lbs/yr
					Phosphorus	1	1	lbs/yr
Project 04-23	Region 5	Streambank Stabilization	Quinnipiac River Watershed Association stream bank stabilization in Quinnipiac Tributary. Used defaults. Bank length 200 ft, 2 banks, height 1 ft on side 1, 2 ft on side 2, 0.06 - 0.2 (moderate) recession ft/yr. Sandy loam soils.	1	Sediment	3.2	3.2	tons/yr
					Nitrogen	5.4	5.4	lbs/yr
					Phosphorus	2.7	2.7	lbs/yr
Project 04-24	None - PI Estimates	Composting Toilets	Used estimate of 4,500 gallons of compost tea produced during year (seasonal) and TN concentration of 1500 mg/L and TP concentration of 0.8 mg/L. 4,500 gallons of compost tea contain lbs of TN and lb of TP.	1	Nitrogen	56	56	lbs/yr
					Phosphorus	1	1	lbs/yr
Project 04-26	Region 5	Streambank Stabilization	Flock Process Dam removal and stream bank stabilization. Fine, sandy loam. Used defaults. Side 1 length 1000 ft, side 2 - 1000 ft., height 3 ft, 0.02 recession	1	Sediment	6	6	tons/yr
					Nitrogen	10.2	10.2	lbs/yr
					Phosphorus	5.2	5.2	lbs/yr
Project 04-27	Region 5	Streambank Stabilization	Merwin Meadows Dam removal and stream bank stabilization. Fine, sandy loam. Used defaults. Side 1 length 1500 ft, side 2 - 1500 ft., height 2 ft, 0.02 recession	1	Sediment	6	6	tons/yr
					Nitrogen	10.2	10.2	lbs/yr

					Phosphorus	5.2	5.2	lbs/yr
Project 04-28	Region 5	Agricultural	IPM Projects in Quinebaug and Shetucket - June nitrate test -assume that their assistance includes only AG Field practices. Select appropriate state and county. The USLE is reduced by 50% as default for support practice only. Consider only N reductions. Acreage will grow each year, assuming all management practices continue year after year. 502 acres , sandy soils, Windham Co.	5	Nitrogen	2116	2543	lbs/yr
Project 04-31	None - PI Estimates	Urban BMPs	Jordan Cove - used PI estimates.	1	Sediment	0.5	0.5	tons/yr
					Nitrogen	43.7	43.7	lbs/yr
					Phosphorus	4.5	4.5	lbs/yr

TMDL?	Prior Links
No	03-03
No	
Yes	
No	
No	03-05SW
Yes	03-05SW
No	03-05SW
No	03-05SW
Yes	03-05SW
No	03-05SW

No	03-05NW
Yes	03-05NW
No	03-05NW
No	03-05CR
Yes	03-05CR
No	03-05CR
No	03-05EA
Yes	03-05EA
No	03-05EA
No	03-05EA
Yes	03-05EA
No	03-05EA
No	03-05NC
Yes	03-05NC

No	03-05NC
No	03-05NC
Yes	03-05NC
No	03-05NC
No	
Yes	
No	
No	
Yes	
No	
Yes	03-24
No	03-24
No	
Yes	
No	
No	
Yes	

No

Yes 03-07

No

Yes

No