

Appendices

Appendix A: Project Worksheets

(still to come)

Appendix B: Relevant CNPCP Management Measures

Agriculture

A. Erosion and Sediment Control Management Measure

Apply any combination of conservation structural and management practices based on U.S. Department of Agriculture – Natural Resources Conservation Service standards and specifications to minimize the delivery of sediment from agricultural lands to surface waters, or

Design and install a combination of management and structural practices to settle the settleable solids and associated pollutants in runoff delivered from the contributing area for storms of up to and including a 10-year, 24-hour frequency.

C. Nutrient Management Measure

Develop, implement, and periodically update a nutrient management plan to: (1) apply nutrients at rates necessary to achieve realistic crop yields, (2) improve the timing of nutrient application, and (3) use agronomic crop production technology to increase nutrient use efficiency. When the source of the nutrients is other than commercial fertilizer, determine the nutrient value. Determine and credit the nitrogen contribution of any legume crop. Soil and/or plant tissue testing should be used at a suitable interval. Nutrient management plans contain the following core components:

1. Farm and field maps showing acreage, crops, soils, and waterbodies.
2. Realistic yield expectations for the crop(s) to be grown, based on achievable yields for the crop. Individual producer constraints and other producer's yields would be considered in determining achievable yields.
3. A summary of the soil condition and nutrient resources available to the producer, which at a minimum would include:
 - An appropriate mix of soil (pH, P, K) and/or plant tissue testing or historic yield response data for the particular crop;
 - Nutrient analysis of manure, sludge, mortality compost (birds, pigs, etc.), or effluent (if applicable);
 - Nitrogen contribution to the soil from legumes grown in the rotation (if applicable); and
 - Other significant nutrient sources (e.g., irrigation water).
4. An evaluation of field limitations based on environmental hazards or concerns, such as:
 - Lava tubes, shallow soils over fractured bedrock, and soils with high leaching or runoff potential,
 - Distance to surface water,
 - Highly erodible soils, and
 - Shallow aquifers.
5. Best available information is used in developing recommendations for the appropriate mix of nutrient sources and requirements for the crops.
6. Identification of timing and application methods for nutrients to: provide nutrients at rates necessary to achieve realistic crop yields; reduce losses to the environment; and avoid applications as much as possible during periods of leaching or runoff.

7. Methods and practices used to prevent soil erosion or sediment loss.
8. Provisions for the proper calibration and operation of nutrient application equipment.

D. Pesticide Management Measure

To eliminate the unnecessary release of pesticides into the environment and to reduce contamination of surface water and ground water from pesticides:

1. Use integrated pest management strategies where available that minimize chemical uses for pest control.
2. Manage pesticides efficiently by:
 1. calibrating equipment;
 2. using appropriate pesticides for given situation and environment;
 3. using alternative methods of pest control; and
 4. minimizing the movement of pest control agents from target area.
3. Use anti-backflow devices on hoses used for filling tank mixtures.
4. Enhance degradation or retention by increasing organic matter content in the soil or manipulating soil pH.

E. Grazing Management Measure

Protect range, pasture and other grazing lands:

1. By implementing one or more of the following to protect sensitive areas (such as streambanks, wetlands, estuaries, ponds, lake shores, near coastal waters/ shorelines, and riparian zones):
 1. Exclude livestock,
 2. Provide stream crossings or hardened watering access for drinking,
 3. Provide alternative drinking water locations,
 4. Locate salt and additional shade, if needed, away from sensitive areas, or
 5. Use improved grazing management (e.g., herding) to reduce the physical disturbance and reduce direct loading of animal waste and sediment caused by livestock; *and*
2. By achieving either of the following on all range, pasture, and other grazing lands not addressed under (1):
 1. Implement range and pasture conservation and management practices that apply the progressive planning approach of USDA-NRCS following the standards and specifications contained in the FOTG that achieve an acceptable level of treatment to reduce erosion, and/or
 2. Maintain range, pasture, and other grazing lands in accordance with activity plans established by the Division of Land Management of DLNR, federal agencies managing grazing land, or other designated land management agencies.

F. Irrigation Water Management Measure

To reduce nonpoint source pollution of surface waters caused by irrigation:

1. Operate the irrigation system so that the timing and amount of irrigation water applied match crop water needs. This will require, as a minimum: (a) the measurement of soil-water depletion volume and the volume of irrigation water applied; (b) uniform application of water; and (c) application rate which does not exceed infiltration rate in the field.
2. When chemigation is used, include backflow preventers for wells, minimize the harmful amounts of chemigated waters that discharge from the edge of the field, and control deep

percolation. In cases where chemigation is performed with furrow irrigation systems, a tailwater management system may be needed.

The following limitations and special conditions apply:

1. In some locations, irrigation return flows are subject to other water rights or are required to maintain stream flow. In these special cases, on-site reuse could be precluded and would not be considered part of the management measure for such locations.
2. By increasing the water use efficiency, the discharge volume from the system will usually be reduced. While the total pollutant load may be reduced somewhat, there is the potential for an increase in the concentration of pollutants in the discharge. In these special cases, where living resources or human health may be adversely affected and where other management measures (nutrients and pesticides) do not reduce concentrations in the discharge, increasing water use efficiency would not be considered part of the management measure.
3. The time interval between the order for and the delivery of irrigation water to the farm may limit the irrigator's ability to achieve the maximum on-farm application efficiencies that are otherwise possible.
4. In some locations, leaching is necessary to control salt in the soil profile. Leaching for salt control should be limited to the leaching requirement for the root zone.
5. Where leakage from delivery systems or return flows supports wetlands or wildlife refuges, it may be preferable to modify the system to achieve a high level of efficiency and then divert the "saved water" to the wetland or wildlife refuge. This will improve the quality of water delivered to wetlands or wildlife refuges by preventing the introduction of pollutants from irrigated lands to such diverted water.
6. In some locations, sprinkler irrigation is used for crop cooling or other benefits (*e.g.*, watercress). In these special cases, applications should be limited to the amount necessary for crop protection, and applied water should not contribute to erosion or pollution.

Urban Areas

Urban Runoff

A. New Development Management Measure

1. By design or performance:
 1. After construction has been completed and the site is permanently stabilized, reduce the average annual total suspended solid (TSS) loadings by 80%. For the purposes of this measure, an 80% TSS reduction is to be determined on an average annual basis,* or
 2. Reduce the postdevelopment loadings of TSS so that the average annual TSS loadings are no greater than predevelopment loadings, and
2. To the extent practicable, maintain postdevelopment peak runoff rate and average volume at levels that are similar to predevelopment levels.

Sound watershed management requires that both structural and nonstructural measures be employed to mitigate the adverse impacts of storm water. Nonstructural Management Measures II.B and II.C can be effectively used in conjunction with Management Measure II.A to reduce both the short- and long-term costs of meeting the treatment goals of this management measure.

C. Site Development Management Measure

Plan, design, and develop sites to:

1. Protect areas that provide important water quality benefits and/or are particularly susceptible to erosion and sediment loss;
2. Limit increases of impervious areas, except where necessary;
3. Limit land disturbance activities such as clearing and grading, and cut and fill to reduce erosion and sediment loss; and
4. Limit disturbance of natural drainage features and vegetation.

Existing Development

A. Existing Development Management Measure

Develop and implement watershed management programs to reduce runoff pollutant concentrations and volumes from existing development:

1. Identify priority local and/or regional watershed pollutant reduction opportunities, e.g., improvements to existing urban runoff control structures;
2. Contain a schedule for implementing appropriate controls;
3. Limit destruction of natural conveyance systems; and
4. Where appropriate, preserve, enhance, or establish buffers along surface waterbodies and their tributaries.

Onsite Disposal Systems

A. New Onsite Disposal Systems (OSDS) Management Measure

1. Ensure that new Onsite Disposal Systems (OSDS) are located, designed, installed, operated, inspected, and maintained to prevent the discharge of pollutants to the surface of the ground and to the extent practicable reduce the discharge of pollutants into ground waters that are closely hydrologically connected to surface waters. Where necessary to meet these objectives: (a) discourage the installation of garbage disposals to reduce hydraulic and nutrient loadings; and (b) where low-volume plumbing fixtures have not been installed in new developments or redevelopments, reduce total hydraulic loadings to the OSDS by 25%. Implement OSDS inspection schedules for preconstruction, construction, and postconstruction;
2. Direct placement of OSDS away from unsuitable areas. Where OSDS placement away from unsuitable areas is not practicable, ensure that the OSDS is designed or sited at a density so as not to adversely affect surface waters or ground water that is closely hydrologically connected to surface water. Unsuitable areas include, but are not limited to, areas with poorly or excessively drained soils; areas with shallow water tables or areas with high seasonal water tables; areas overlaying fractured bedrock that drain directly to ground water; areas within floodplains; or areas where nutrient and/or pathogen concentrations in the effluent cannot be sufficiently treated or reduced before the effluent reaches sensitive waterbodies;
3. Establish protective setbacks from surface waters, wetlands, and floodplains for conventional as well as alternative OSDS. The lateral setbacks should be based on soil type, slope, hydrologic factors, and type of OSDS. Where uniform protective setbacks cannot be achieved, site development with OSDS so as not to adversely affect waterbodies and/or contribute to a public health nuisance;
4. Establish protective separation distances between OSDS system components and groundwater which is closely hydrologically connected to surface waters. The separation distances should be based on soil type, distance to ground water, hydrologic factors, and type of OSDS;

5. Where conditions indicate that nitrogen-limited surface waters may be adversely affected by excess nitrogen loadings from ground water, require the installation of OSDS that reduce total nitrogen loadings by 50% to groundwater that is closely hydrologically connected to surface water.

B. Operating OSDS Management Measure

1. Establish and implement policies and systems to ensure that existing OSDS are operated and maintained to prevent the discharge of pollutants to the surface of the ground and to the extent practicable reduce the discharge of pollutants into ground waters that are closely hydrologically connected to surface waters. Where necessary to meet these objectives, encourage the reduced use of garbage disposals, encourage the use of low-volume plumbing fixtures, and reduce total phosphorus loadings to the OSDS by 15% (if the use of low-level phosphate detergents has not been required or widely adopted by OSDS users). Establish and implement policies that require an OSDS to be repaired, replaced, or modified where the OSDS fails, or threatens or impairs surface waters;
2. Inspect OSDS at a frequency adequate to ascertain whether OSDS are failing;
3. Consider replacing or upgrading OSDS to treat influent so that total nitrogen loadings in the effluent are reduced by 50%. This provision applies only:
 1. where conditions indicate that nitrogen-limited surface waters may be adversely affected by significant groundwater nitrogen loadings from OSDS, and
 2. where nitrogen loadings from OSDS are delivered to groundwater that is closely hydrologically connected to surface water.

Pollution Prevention

A. Pollution Prevention Management Measure

Implement pollution prevention and education programs to reduce nonpoint source pollutants generated from the following activities, where applicable:

1. The improper storage, use, and disposal of household hazardous chemicals, including automobile fluids, pesticides, paints, solvents, etc.;
2. Lawn and garden activities, including the application and disposal of lawn and garden care products, and the improper disposal of leaves and yard trimmings;
3. Turf management on golf courses, parks, and recreational areas;
4. Improper operation and maintenance of onsite disposal systems;
5. Discharge of pollutants into storm drains including floatables, waste oil, and litter;
6. Commercial activities including parking lots, gas stations, and other entities not under NPDES purview; and
7. Improper disposal of pet excrement.

B. Golf Course Management Measure

1. Develop and implement grading and site preparation plans to:
 1. Design and install a combination of management and physical practices to settle solids and associated pollutants in runoff from heavy rains and/or from wind;
 2. Prevent erosion and retain sediment, to the extent practicable, onsite during and after construction;
 3. Protect areas that provide important water quality benefits and/or are environmentally-sensitive ecosystems;

4. Avoid construction, to the extent practicable, in areas that are susceptible to erosion and sediment loss;
 5. Protect the natural integrity of waterbodies and natural drainage systems by establishing streamside buffers; and
 6. Follow, to the extent practicable, the amended U.S. Golfing Association (USGA) guidelines for the construction of greens.
2. Develop nutrient management guidelines appropriate to Hawai'i for qualified superintendents to implement so that nutrients are applied at rates necessary to establish and maintain vegetation without causing leaching into ground and surface waters.
 3. Develop and implement an integrated pest management plan. Follow EPA guidelines for the proper storage and disposal of pesticides.
 4. Develop and implement irrigation management practices to match the water needs of the turf.

Roads, Highways, and Bridges

A. Management Measure for Planning, Siting, and Developing Roads and Highways

Plan, site, and develop roads and highways to:

1. Protect areas that provide important water quality benefits or are particularly susceptible to erosion or sediment loss;
2. Limit land disturbance such as clearing, grading and cut and fill to reduce erosion and sediment loss; and
3. Limit disturbance of natural drainage features and vegetation.

B. Management Measure for Bridges

Site, design, and maintain bridge structures so that sensitive and valuable aquatic ecosystems and areas providing important water quality benefits are protected from adverse effects.

E. Management Measure for Operation and Maintenance

Incorporate pollution prevention procedures into the operation and maintenance of roads, highways, and bridges to reduce pollutant loadings to surface waters.

F. Management Measure for Road, Highway, and Bridge Runoff Systems

Develop and implement runoff management systems for existing roads, highways, and bridges to reduce runoff pollutant concentrations and volumes entering surface waters.

1. Identify priority and watershed pollutant reduction opportunities (e.g., improvements to existing urban runoff control structures); and
2. Establish schedules for implementing appropriate controls.

Hydromodifications

Channelization and Channel Modification

A. Management Measure for Physical and Chemical Characteristics of Surface Waters

1. Evaluate the potential effects of proposed channelization and channel modification on the physical and chemical characteristics of surface waters in coastal areas;
2. Plan and design channelization and channel modification to reduce undesirable impacts; and

3. Develop an operation and maintenance program for existing modified channels that includes identification and implementation of opportunities to improve physical and chemical characteristics of surface waters in those channels.

B. Instream and Riparian Habitat Restoration Management Measure

1. Evaluate the potential effects of proposed channelization and channel modification on instream and riparian habitat in coastal areas;
2. Plan and design channelization and channel modification to reduce undesirable impacts; and
3. Develop an operation and maintenance program with specific timetables for existing modified channels that includes identification of opportunities to restore instream and riparian habitat in those channels.

Dams

C. Management Measure for Protection of Surface Water Quality and Instream and Riparian Habitat

Develop and implement a program to manage the operation of dams in coastal areas that includes an assessment of:

1. Surface water quality and instream and riparian habitat and potential for improvement and
2. Significant nonpoint source pollution problems that result from excessive surface water withdrawals.

Streambank and Shoreline Erosion

A. Management Measure for Eroding Streambanks and Shorelines

1. Where streambank or shoreline erosion is a serious nonpoint source pollution problem, streambanks and shorelines may need to be stabilized. Vegetative methods are strongly preferred. Structural methods may be necessary where vegetative methods cannot work and where they do not interfere with natural beach processes or harm other sensitive ecological areas.
2. Protect streambank and shoreline features with the potential to reduce nonpoint source pollution.
3. Protect streambanks and shorelines from erosion due to uses of either the shorelands or adjacent surface waters.
4. Where artificial fill is eroding into adjacent streams or coastal waters, it should be removed.

Wetlands, Riparian Areas, and Vegetated Treatment Systems

A. Management Measure for Protection of Wetlands and Riparian Areas

Protect from adverse effects wetlands and riparian areas that are serving a significant nonpoint source pollution abatement function and maintain this function while protecting the other existing functions of these wetlands and riparian areas as measured by characteristics such as vegetative composition and cover, hydrology of surface water and ground water, geochemistry of the substrate, and species composition.

B. Management Measure for Restoration of Wetlands and Riparian Areas

Promote the restoration of the pre-existing functions in damaged and destroyed wetlands and riparian systems in areas where the systems will serve a significant nonpoint source pollution abatement function.

C. Management Measure for Vegetated Treatment Systems

Promote the use of engineered vegetated treatment systems such as constructed wetlands or vegetated filter strips where these systems will serve a significant nonpoint source pollution abatement function.

Appendix C: EPA’s Nine Key Elements

To ensure that Section 319 projects funded with incremental dollars make progress towards restoring waters impaired by nonpoint source pollution, watershed-based plans that are developed or implemented with Section 319 funds to address 303(d)-listed waters must include at least the elements listed below.

a. An identification of the causes and sources or groups of similar sources that will need to be controlled to achieve the load reductions estimated in this watershed-based plan, as discussed in item (b) immediately below. Sources that need to be controlled should be identified at the significant subcategory level with estimates of the extent to which they are present in the watershed.

This element is addressed in Chapter 4 “Threats to the Water Quality of the Watershed” and, to a lesser extent, Chapters 2 and 3.

b. An estimate of the load reductions expected for the management measures described under paragraph (c) below (recognizing the natural variability and the difficulty in precisely predicting the performance of management measures over time).

This element is addressed in Chapter 5 “Recommended Management Measures” and Appendix A of the WWMP.

c. A description of the NPS management measures that will need to be implemented to achieve the load reductions estimated under paragraph (b) above, and an identification of the critical areas in which those measures will be needed to implement this plan.

This element is addressed in Chapter 5 “Recommended Management Measures” and Appendix A of the WWMP.

d. An estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon, to implement this plan. As sources of funding, States should consider the use of their Section 319 programs, State Revolving Funds, USDA’s Environmental Quality Incentives Program and Conservation Reserve Program, and other relevant Federal, State, local and private funds that may be available to assist in implementing this plan.

This element is addressed in Chapter 5 “Recommended Management Measures” and Appendix A of the WWMP.

e. An information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the NPS management measures that will be implemented.

This element is addressed in Chapter 5 “Recommended Management Measures” and Appendix A of the WWMP.

f. A schedule for implementing the NPS management measures identified in this plan that is reasonably expeditious.

This element is addressed in Chapter 5 “Recommended Management Measures” and Appendix A of the WWMP.

g. A description of interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented.

This element is addressed in Chapter 5 “Recommended Management Measures” and Appendix A of the WWMP.

h. A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether this watershed-based plan needs to be revised.

This element is addressed in Chapter 5 “Recommended Management Measures” and Chapter 6 “Monitoring” of the WWMP.

i. A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item (h) immediately above.

This element is addressed in Chapter 6 “Monitoring” of the WWMP.