APPENDIX F

STORM WATER PERMITTING REQUIREMENTS AND PRESUMPTIVE BEST MANAGEMENT PRACTICES (BMPs) APPROACH

A. BACKGROUND

The National Pollutant Discharge Elimination System (NPDES) permitting program for stormwater discharges was established under the Clean Water Act as the result of a 1987 amendment. The Act specifies the level of control to be incorporated into the NPDES stormwater permitting program depending on the source (industrial versus municipal stormwater). These programs contain specific requirements for the regulated communities/facilities to establish a comprehensive stormwater management program (SWMP) or storm water pollution prevention plan (SWPPP) to implement any requirements of the total maximum daily load (TMDL) allocation. [See 40 CFR §130.]

Storm water discharges are highly variable both in terms of flow and pollutant concentration, and the relationships between discharges and water quality can be complex. For municipal stormwater discharges in particular, the current use of system-wide permits and a variety of jurisdiction-wide BMPs, including educational and programmatic BMPs, does not easily lend itself to the existing methodologies for deriving numeric water quality-based effluent limitations. These methodologies were designed primarily for process wastewater discharges which occur at predictable rates with predictable pollutant loadings under low flow conditions in receiving waters.

EPA has recognized these problems and developed permitting guidance for stormwater permits. [See "Interim Permitting Approach for Water Quality-Based Effluent Limitations in Stormwater Permits" (EPA-833-D-96-00, Date published: 09/01/1996)] Due to the nature of storm water discharges, and the typical lack of information on which to base numeric water quality-based effluent limitations (expressed as concentration and mass), EPA recommends an interim permitting approach for NPDES storm water permits which is based on BMPs. "The interim permitting approach uses best management practices (BMPs) in first-round storm water permits, and expanded or better-tailored BMPs in subsequent permits, where necessary, to provide for the attainment of water quality standards." (*ibid.*)

A monitoring component is also included in the recommended BMP approach. "Each storm water permit should include a coordinated and cost-effective monitoring program to gather necessary information to determine the extent to which the permit provides for attainment of applicable water quality standards and to determine the appropriate conditions or limitations for subsequent permits." (*ibid.*)

This approach was further elaborated in a guidance memo issued in 2002. [See Memorandum from Robert Wayland, Director of OWOW and James Hanlon, Director of OWM to Regional Water Division Directors: "Establishing Total Maximum Daily Load (TMDL) Wasteload Allocations (WLAs) for Storm Water Sources and NPDES Permit requirements Based on Those WLAs " (Date published: 11/22/2002)] "The policy outlined in this memorandum affirms the appropriateness of an iterative, adaptive management BMP approach, whereby permits include effluent limits (e.g., a combination of structural and non-structural BMPs) that address storm water discharges, implement mechanisms to evaluate the performance of such controls, and make adjustments (i.e., more stringent controls or specific BMPs) as necessary to protect water quality. …… If it is determined that a BMP approach (including an iterative BMP approach) is appropriate to meet the storm water component of the TMDL, EPA recommends that the TMDL reflect this." This TMDL adopts the EPA recommended approach and relies on appropriate BMPs for implementation. No numeric effluent limitations are required or anticipated for municipal stormwater discharge permits.

B. SPECIFIC SWMP/SWPPP REQUIREMENTS

As noted in Section 3 of this report, Oklahoma Pollutant Discharge Elimination System (OPDES)-permitted facilities and non-point sources (e.g., wildlife, agricultural activities and domesticated animals, land application fields, urban runoff, failing onsite wastewater disposal system, and domestic pets) could contribute to exceedances of the water quality criteria. In particular, stormwater runoff from the Phase 1 and 2 municipal separate storm sewer systems (MS4s) is likely to contain elevated bacteria concentrations. Permits for these discharges must comply with the provisions of this TMDL. Table F-1 provides a list of Phase 1 and 2 MS4s that are affected by the TMDL for the North Canadian River Basin.

Agricultural activities and other nonpoint sources of bacteria are unregulated. Voluntary measures and incentives should be used and encouraged wherever possible and such sources should strive to attain the reduction goals established in this TMDL. However, the provisions of this appendix apply only to NPDES regulated stormwater discharges. CAFO permits in the watershed and their associated management plans should be reviewed to determine if further actions are necessary to reduce bacteria loads. This recommendation will be forwarded to EPA and the Oklahoma Department of Agriculture, Food, and Forestry for follow up.

To ensure compliance with the TMDL requirements under the permit, stormwater permittees must develop strategies designed to meet the reduction goals established in the TMDL. Relying primarily upon a Best Management Practices (BMP) approach, permittees should take advantage of existing information on BMP performance and select a suite of BMPs appropriate to the local community that are expected to meet all or part of the reduction goals established in the TMDL. The permittee should provide guidance on BMP installation and maintenance, as well as a monitoring and/or inspection schedule. Table F–2 provides a summary description of some BMPs with reported effectiveness in reducing bacteria. Permittees may choose different BMPs to meet the permit

requirements, as long as the permittees demonstrate that these practices will lead to compliance with water quality standards.

Table F-1. MS4 Permits that are affected by the bacteria TMDL for North Canadian River Basin

ENTITIES	PHASE 1 MS4 OR PHASE 2 MS4	DATE ISSUED	NOTES
Bethany, City of	Phase 2 MS4	03/20/2006	
Choctaw, City of	Phase 2 MS4	01/18/2006	
Del City, City of	Phase 2 MS4	12/29/2005	
Midwest City	Phase 2 MS4	11/07/2005	
Moore, City of	Phase 2 MS4	12/01/2005	
Mustang, City of	Phase 2 MS4	02/15/2006	
Nicoma Park, City of	Phase 2 MS4	01/05/2006	
Oklahoma Department of Transportation (ODOT)	Phase 1 MS4 & Phase 2 MS4	08/09/2001-Phase 1	Phase 2 MS4 permit under the DEQ review
Oklahoma City	Phase 1 MS4	08/09/2001	
Oklahoma Turnpike Authority (OTA)	Phase 1 MS4 & Phase 2 MS4	08/09/2001-Phase 1 05/23/2006-Phase 2	
Spencer, City of	Phase 2 MS4	10/13/2005	
Tinker AFB	Phase 2 MS4	11/08/2005	
Warr Acres, City of	Phase 2 MS4	01/27/2006	
Yukon, City of	Phase 2 MS4	11/15/2005	

As noted above, when a BMP approach is selected a coordinated monitoring program is necessary to establish the effectiveness of the selected BMPs and demonstrate progress toward attaining water quality standards. The monitoring results should be used to refine bacteria controls in the future. With fourteen permitted entities in the watershed, it is likely that a cooperative monitoring program would be more cost-effective than fourteen individual programs. The Association of Central Oklahoma Governments (ACOG) has expressed interest in facilitating a coordinated monitoring program to address this requirement. Individual permittees are not required to participate in a coordinated program and are free to develop their own program if desired.

After EPA approval of the final TMDL, existing small MS4 permittees will be notified of the TMDL provisions and schedule. The “Phase 1” permit for the City of Oklahoma City, Oklahoma Department of Transportation, and Oklahoma Turnpike Authority expires in August 2006. The re-issued permit will contain provisions addressing this TMDL. Industrial stormwater permittees are not expected to be a significant source of bacteria but if any are identified, similar actions will be required. Compliance with the following provisions will constitute compliance with the requirements of this TMDL.

1. Develop A Bacteria Reduction Plan

Permittees shall submit an approvable Bacteria Reduction Plan to the DEQ within 12 months of notification. Unless disapproved by the Director within 60 days of submission, the plan shall be approved then implemented by the permittee. This plan shall, at a minimum, include the following:

a. Consideration of ordinances or other regulatory mechanisms to require bacteria pollution control, as well enforcement procedures for noncompliance;
b. Evaluation of the existing SWMP in relation to TMDL reduction goals;
c. Educational programs directed at reducing bacterial pollution;
d. Investigation and implementation of BMPs that prevent additional storm water bacteria pollution associated with new development and re-development;
e. Implementation of BMPs applicable to bacteria. Table F—2 below presents summary information on some BMPs that should be considered. Permittees are not limited to BMPs on this list and should select BMPs appropriate to the local community that are expected to meet all or part of the reduction goals established in the TMDL.
f. Modifications to the dry weather field screening and illicit discharge detection and elimination provisions of the SWMP to consider storm water sampling and other measures intended to specifically identify bacterial pollution sources and high priority areas for bacteria reductions.
g. Periodic evaluation of the effectiveness of the bacteria reduction plan to ensure progress toward attainment of water quality standards.
h. An implementation schedule leading to modification of the SWMP and full implementation of the plan within 2 years of notification.

2. Develop Or Participate In A Bacteria Monitoring Program

Permittees may participate in a coordinated regional bacteria monitoring program or develop their own individual program. The monitoring program should be designed to establish the effectiveness of the selected BMPs and demonstrate progress toward the reduction goals of the TMDL and eventual attainment of water quality standards.

a. Within 18 months of notification, the permittee shall prepare and submit to the DEQ either a TMDL monitoring schedule or a commitment to participate in a coordinated regional monitoring program. The schedule or program shall include:
    (1) A detailed description of the goals, monitoring, and sampling and analytical methods;
    (2) A list and map of the selected TMDL monitoring sites;
    (3) The frequency of data collection to occur at each station or site;
    (4) The parameters to be measured, as appropriate for and relevant to the TMDL;
    (5) A Quality Assurance Project Plan that complies with EPA requirements [EPA Requirements for QA Project Plans (QA/R-5)]
b. The monitoring program shall be fully implemented within 2 years of notification.

3. Annual Reporting

The permittee shall include a TMDL implementation report as part of their annual report. The TMDL report shall include the status and actions taken by the permittee to implement the TMDL. The TMDL report shall document relevant actions taken by the permittee that affect MS4 storm water discharges to the waterbody segment that is the subject of the TMDL. This TMDL report also shall identify the status of any applicable TMDL implementation schedule milestones.

Table F–2. Some BMPs Applicable to Bacteria

BEST MANAGEMENT PRACTICE	IMPAIRMENT SOURCE		REPORTED EFFICIENCY	NOTE
	AGRICULTURE	URBAN		
Animal waste management: A planned system designed to manage liquid and solid waste from livestock and poultry. It improves water quality by storing and spreading waste at the proper time, rate and location.	X		75 %[1]	
Artificial wetland/rock reed microbial filter: Long shallow hydroponic plant/rock filter system that treats polluted waste and wastewater. It combines horizontal and vertical flow of water through the filter (filled with aquatic and semi-aquatic plants and microorganisms) and provides a high surface area of support media, such as rocks or crushed stone.	X	X		
Compost facility: Treating organic agricultural wastes in order to reduce the pollution potential to surface and ground water. The composting facility must be constructed, operated and maintained without polluting air and/or water resources.	X	X		
Conservation landscaping: The placement of vegetation in and around stormwater management BMPs. Its purpose is to help stabilize disturbed areas, enhance the pollutant removal capabilities of storm water BMP, and improve the overall aesthetics of a storm water BMP.		X		
Detention pond/basin: Detention ponds/basins maintain a permanent pool of water in addition to temporarily detaining storm water. The permanent pool of water enhances the removal of many pollutants. These ponds fill with stormwater and release most of it over a period of a few days, slowly returning to its normal depth of water.	X	X	25 %[1], 40%[2], 51%[3]	
Diversions/earthen embankments: 1). Diversions -Establishing a channel with a supporting ridge on the lower side constructed along the general land slope which improves water quality by directing	X	X		

BEST MANAGEMENT PRACTICE	IMPAIRMENT SOURCE		REPORTED EFFICIENCY	NOTE
	AGRICULTURE	URBAN		
nutrient and sediment laden water to sites where it can be used or disposed of safely. 2). Earthen embankment- A raised impounding structure made from compacted soil. It is appropriate for use with infiltration, detention, extended-detention or retention facilities.				
Drain Inlet Inserts: A proprietary BMP that is generally easily installed in a drain inlet or catch basin to treat storm water runoff. Three basic types of inlet insert are available, the tray type, bag type and basket type. The tray type allows flow to pass through filter media residing in a tray located around the perimeter of the inlet.		X	5%[2]	
Drip irrigation: An irrigation method that supplies a slow, even application of low-pressure water through polyethylene tubing running from supply line directly to a plant's base. Water soaks into the soil gradually, reducing runoff and evaporation (i.e., salinity). Transmission of nutrients and pathogens spread by splashing water and wet foliage created by overhead sprinkler irrigation is greatly reduced. Weed growth is minimized, thereby reducing herbicide applications. Vegetable farming and virtually every type of landscape situation can benefit from the use of drip irrigation.	X	X		
Fencing: A constructed barrier to livestock, wildlife or people. Standard or conventional (barbed or smooth wire), suspension, woven wire, or electric fences shall consist of acceptable fencing designs to control the animal(s) or people of concern and meet the intended life of the practice.	X		75 %[1]	
Filtration (e.g., sand filters): Intermittent sand filters capture, pre-treat to remove sediments, store while awaiting treatment, and treat to remove pollutants (by percolation through sand media) the most polluted stormwater from a site. Intermittent sand filter BMPs may be constructed in underground vaults, in paved trenches within or at the perimeter of impervious surfaces, or in either earthen or concrete open basins.	X	X	30 %[1], 55%[2], 51%[3]	
Infiltration Basin: A vegetated open impoundment where incoming stormwater runoff is stored until it gradually infiltrates into the soil strata. While flooding and channel erosion control may be achieved within an infiltration basin, they are primarily used for water quality enhancement.		X	50 %[1]	
Infiltration Trench: A shallow, excavated trench backfilled with a coarse stone aggregate to create an underground reservoir. Stormwater runoff diverted into the trench gradually infiltrates into the surrounding soils from the bottom and sides of the trench. The trench can be either an open surface		X	50 %[1]	

BEST MANAGEMENT PRACTICE	IMPAIRMENT SOURCE		REPORTED EFFICIENCY	NOTE
	AGRICULTURE	URBAN		
trench or an underground facility.				
Irrigation water management: The process of determining and controlling the volume, frequency, and application rate of irrigation water in a planned, efficient manner. An irrigation system adapted for site conditions (soil, slope, crop grown, climate, water quantity and quality, etc.) must be available and capable of applying water to meet the intended purpose(s).	X	X		
Lagoon pump out: A waste treatment impoundment made by constructing an embankment and/or excavating a pit or dugout in order to biologically treat waste (such as manure and wastewater) and thereby reduce pollution potential by serving as a treatment component of a waste management system.	X	X		
Land-use conversion: BMPs that involve a change in land use in order to retire land contributing detrimentally to the environment. Some examples of BMPs with associated land use changes are: Conservation Reserve Program (CRP) - cropland to pasture; Forest conservation - pervious urban to forest; Forest/grass buffers - cropland to forest/pasture; Tree planting - cropland/pasture to forest; and Conservation tillage – conventional tillage to conservation tillage.	X	X		
Limit livestock access: Excluding livestock from areas where grazing or trampling will cause erosion of stream banks and lowering of water quality by livestock activity in or adjacent to the water. Limitation is generally accomplished by permanent or temporary fencing. In addition, installation of an alternative water source away from the stream has been shown to reduce livestock access.	X			
Litter control: Litter includes larger items and articulates deposited on street surfaces, such as paper, vegetation residues, animal feces, bottles and broken glass, plastics and fallen leaves. Litter-control programs can reduce the amount of deposition of pollutants by as much as 50%, and may be an effective measure of controlling pollution by storm runoff.		X		
Livestock water crossing facility: Providing a controlled crossing for livestock and/or farm machinery in order to prevent streambed erosion and reduce sediment.	X		100 %[1]	
Manufactured BMP systems: Structural measures which are specifically designed and sized by the manufacturer to intercept storm water runoff and prevent the transfer of pollutants downstream. They are used solely for water quality enhancement in urban and ultra-urban areas where surface BMPs are	X	X		

BEST MANAGEMENT PRACTICE	IMPAIRMENT SOURCE		REPORTED EFFICIENCY	NOTE
	AGRICULTURE	URBAN		
not feasible.				
Onsite treatment system installation: Conventional onsite wastewater treatment and disposal system (onsite system) consists of three major components: a septic tank, a distribution box, and a subsurface soil absorption field (consisting of individual trenches). This system relies on gravity to carry household waste to the septic tank, move effluent from the septic tank to the distribution box, and distribute effluent from the distribution box throughout the subsurface soil absorption field. All of these components are essential for a conventional onsite system to function in an acceptable manner.		X		
Porous pavement: An alternative to conventional pavement, it is made from asphalt (in which fine filler fractions are missing) or modular or poured-in concrete pavements. Its use allows rainfall to percolate through it to the sub-base, providing storage and enhancing soil infiltration that can be used to reduce runoff and combined sewer overflows. The water stored in the sub-base then gradually infiltrates the subsoil.		X	50 %[1]	
Proper site selection for animal feeding facility: Establishing or relocating confined feeding facilities away from environmentally vulnerable areas such as sinkholes, streams, and rivers in order to reduce or eliminate the amount of pollutant runoff reaching these areas.	X			
Rain garden /bio-retention basin: Rain gardens are landscaped gardens of trees, shrubs, and plants located in commercial or residential areas in order to treat storm water runoff through temporary collection of the water before infiltration. They are slightly depressed areas into which storm water runoff is channeled by pipes, curb openings, or gravity.		X	40 %[1]	
Range and pasture management: Systems of practices to protect the vegetative cover on improved pasture and native rangelands. It includes practices such as seeding or reseeding, brush management (mechanical, chemical, physical, or biological), proper stocking rates and proper grazing use, and deferred rotational systems.	X		50 %[1]	
Retention ponds/basins Retention basin: A storm water facility that includes a permanent pool of water and, therefore, is normally wet even during non-rainfall periods. Inflows from storm water runoff may be temporarily stored above this permanent pool.	X	X	32 %[1]	
Riparian Buffer Zone: A protection method used along streams to reduce erosion, sedimentation, and the pollution of water from agricultural non-point	X	X	43 – 57 %[1]	Forested buffer w/o incentive payment

BEST MANAGEMENT PRACTICE	IMPAIRMENT SOURCE		REPORTED EFFICIENCY	NOTE
	AGRICULTURE	URBAN		
sources.				
Septic system pump-out: A typical septic system consists of a tank that receives waste from a residence or business, and a drain field or subsurface absorption system consisting of a series of percolation lines for the disposal of the liquid effluent. Solids (sludge) that remain after decomposition by bacteria in the tank must be pumped out periodically.		X	5 %[1]	
Sewer line maintenance/sewer flushing: Sewer flushing during dry weather is designed to periodically remove solids that have deposited on the bottom of the sewer and the biological slime that grows on the walls of combined sewers during periods of low-flow. Flushing is especially necessary in sewer systems that have low grades which has resulted in velocities during low-flow periods that fall below those needed for self-cleaning.		X		
Stream bank protection and stabilization (e.g., riprap, gabions): Stabilizing shoreline areas that are being eroded by landscaping, constructing bulkheads, riprap revetments, gabion systems, or establishing vegetation.	X	X	40 - 75 %[1]	40 % w/o fencing; 75 % w/ fencing
Terrace: An earth embankment, or a combination ridge and channel, constructed across the field slope. Terraces can be used when there is a need to conserve water, excessive runoff is a problem, and the soils and topography are such that terraces can be constructed and farmed with reasonable effort.	X	X		
Vegetated filter strip: A densely vegetated strip of land engineered to accept runoff from upstream development as overland sheet flow. It may adopt any naturally vegetated form, from grassy meadow to small forest. The purpose of a vegetated filter strip is to enhance the quality of stormwater runoff through filtration, sediment deposition, infiltration and absorption.	X	X		
Waste system/storage (e.g., lagoons, litter shed): Waste treatment lagoons biologically treat liquid waste to reduce the nutrient and BOD content. Lagoons must be emptied and their contents disposed of properly.	X	X	80 – 100 %[1]	
Water treatment (e.g., disinfection, flocculation, carbon filter system) Water treatment: Physical, chemical and/or biological processes used to treat concentrated discharges. Physical-chemical processes that have been demonstrated to effectively treat discharge include sedimentation, vortex separation, screening (e.g., fine-mesh screening), and sand-peat filters. Chemical additives used to enhance separation of particles from liquid include	X	X		

BEST MANAGEMENT PRACTICE	IMPAIRMENT SOURCE		REPORTED EFFICIENCY	NOTE
	AGRICULTURE	URBAN		
chemical coagulants such as lime, alum, ferric chloride, and various polyelectrolytes. Biological processes that have been demonstrated to effectively treat discharges include contact stabilization, biodiscs, oxidation ponds, aerated lagoons, and facultative lagoons.				
Wetland development/enhancement: The construction of a wetland for the treatment of animal waste runoff or storm water runoff. Wetlands improve water quality by removing nutrients from animal waste or sediments and nutrients from storm water runoff.	X	X	30 %[1]	Including creation and restora-tion

[1] Sources: BMP Efficiencies Chesapeake Bay Watershed Model (Phase IV) August 1999; Draft FC and Nitrate TMDL IP for Dry River (2001); EPA (1998); EPA (1999b); Novotny (1994); Storm Water Best Management Practice Categories and Pollutant Removal Efficiencies (2003); USDA (2003); DCR (1999); DEQ/DCR (2001).

[2] Barrett, M.E., Complying with the Edwards Aquifer Rules: Technical Guidance on Best Management Practices, Texas Natural Resource Conservation Commission Report RG-348, June, (1999).

[3] Watershed Protection Techniques. *Vol 3. No. 1*, 1999