The assessment should include an identification of those specific areas where the street sweeping efficiencies could be significantly increased and the practicality of implementing these requirements in high density areas with little off-street parking. Year-round requirements or extending the snow removal alternate-side parking period into the fall and spring are two approaches which should be considered.

Madison and Middleton should work with commercial establishments and institutions to establish a frequent sweeping program (once every two weeks) for large commercial and institutional parking lots in the watershed. Also, the opportunities for shallow ponding of stormwater, especially on infrequently used areas of such lots, should be investigated.

Large impervious surfaces such as parking lots and commercial establishments shown on the map entitled "Recommended Urban Nonpoint Source Control Measures" may be significant sources of particulates, litter, oil, grease and other contaminants. These large parking lots, such as those found in the Gammon-Odana Road area and those in the vicinity of Hilldale, have a high delivery of runoff and pollutants. Frequent sweeping of such areas can prevent substantial quantities of particulates from reaching the storm sewer system. Temporary ponding of stormwater on large infrequently used impervious surfaces can result in additional hydrologic and water quality benefits.

Madison, Middleton, Waunakee and Shorewood Hills should review the adequacy of their leaf collection programs and implement improved practices where necessary to minimize the transport of leaves and other vegetative debris to drainage systems. It is further recommended that extensive public education efforts be undertaken to provide consistent information on the proper disposal of leaves and other vegetative debris.

Portions of the Willow Creek subwatershed, Spring Harbor subwatershed and the City of Middleton have dense tree cover. Heavy leaf fall may result in substantial loadings of phosphorus and organic materials reaching the storm sewer system. A fall 1976 inventory of street debris showed 166 pounds per curb mile of leaves containing 1.02 pounds of phosphorus per curb mile in an older neighborhood of Willow Creek.

Past surveys of management practices in Madison have pointed out that public confusion exists as to proper leaf removal methods. Some residents may be directed to move leaves to the curb area, while others are directed to leave them in the strip between the street and sidewalk, and still others are instructed to bag leaves for collection with garbage. Confusion over the preferred method of leaf management makes for an inefficient public leaf collection program.

This plan recommends that leaves be kept out of the street gutter. Also, existing public leaf collection programs should be maintained or upgraded (where inadequate) and that extensive and uniformly consistent public information and education programs be undertaken. Instructions telling residents to bag leaves or return them to their property in the form of mulch, compost, etc. would alleviate confusion and allow for efficient public leaf collection. Additional street sweeping during the fall is recommended as a measure to complement public leaf collection.

The City of Madison should immediately implement measures to stabilize the main channel of the Spring Harbor drainage system within the Owen Park Conservancy Area and take other steps necessary to assure continued future protection and stability of the drainage channels.

Owen Park is on the main branch of the Spring Harbor drainage system. Extensive upstream development since 1965 has resulted in large and continuing increases in stormwater flow within the park's main and tributary drainage channels. Since drainageways within the Owen Park Conservancy Area have been left in their natural state, with no structural stabilization methods employed, severe channel erosion is occurring. Due to high peak flow velocities and limited opportunities for detention and sedimentation below Owen Park, sediment and associated phosphorus eroded from the channel's bed and walls and delivered to Lake Mendota during storm flow.

Structural stabilization of this section of the drainage system is recommended.

The City of Madison should construct detention storage facilities on existing public lands in the Spring Harbor subwatershed to provide continuing downstream protection for the Owen Park area and provide additional water quality benefits to augment planned or in-place management practices in the watershed.

The potential exists to construct two additional neighborhood level detention basins in the Spring Harbor subwatershed. These facilities would provide water quality and downstream protection benefits, and would be similar in character to the existing Nautilus detention basin, except that longer detention periods or french drains would be employed to yield greater pollutant reduction. The two basins currently proposed would provide additional protection to tributary drainage channels in the Owen Park Conservancy which are beginning to experience active erosion. Both of the detention basins would lie within publicly owned land.

The City of Madison should consider the future need for a stormwater detention basin in the vicinity of Garner Park and South Hill Drive. It would provide continuing sediment and pollutant control needs and downstream protection at the time the portion of University Farms upstream from this area is developed.

The City of Middleton should continue to stabilize the channel of Pheasant Branch Creek to minimize both streambank and streambed erosion which contribute excessive sediment, threaten natural resources and man-made structures, and adversely impact the Pheasant Branch Marsh.

Within the City of Middleton, Pheasant Branch Creek has a severely eroded channel which is undergoing continuing significant change as the stream attempts to stabilize itself within the area of sandy, readily erodible subsoils. Several studies have been undertaken to characterize the changes in channel morphology, and the movement and transport of sediment in the deeply entrenched section of the creek within Middleton. A preliminary report on Channel Erosion and Sediment Transport in Pheasant Branch Basin near Middleton, Wisconsin (USGS, 1980) indicates that the average channel bottom elevation dropped three to four feet between 1971 and 1977 at some sites in the urban area. In the same period, channel width downstream from Century Avenue increased from about 35 to 48 feet and channel cross-sectional area increased an average of 86%.

A 1980 report by Spooner Engineering - North entitled Sediment and Erosion Control Investigations, Pheasant Branch Creek notes existing erosion and sediment control and resource protection measures employed on Pheasant Branch Creek have had varying effectiveness. While drop structures appear to have been effective in holding channel elevations immediately upstream from the structures, considerable streambed scouring has continued to occur.

Streambank protection measures have been employed at several locations in the urban portion of Pheasant Branch Creek. Gabions have generally proven to be an effective streambank protection method, although toe erosion has caused partial failure of one gabion wall. Sheet piling, and sheet piling in combination with gabions have both proven to be effective in controlling streambank erosion.

The Spooner report (1980) concludes that meandering and bank erosion will continue to be a problem in the urban section of Pheasant Branch Creek, and recommends that meandering be allowed to continue. This recommendation is qualified by the recognition that there are situations where bank erosion cannot be allowed to go unchecked. For these situations, the Spooner report recommends initial treatment consisting of sheet piling toe protection and slope planting. Gabions or other additional measures are recommended where sheet piling along proves to be inadequate or where further measures are clearly needed.

Upstream of Century Avenue, it is estimated that structural stabilization of approximately 2,360 feet of streambank would provide fairly complete control of significant erosion while affording necessary protection to structures and utilities threatened by streambank erosion. This work should be ranked in order of importance and the most important addressed first. A preliminary ranking has been made as part of this plan, and places 1,340 feet of the Pheasant Branch Creek streambank stabilization work in a high priority category. Cost-sharing is recommended for the high and medium ranked sites, but the high priority sites should be addressed first.

To deal with excessive streambed erosion below the sewer and water crossing just upstream of Century Avenue, the Spooner report concurs that a proposed drop structure just below Century Avenue is warranted. This structure would also combat continued erosion which poses a threat to the structural integrity of the Century Avenue highway bridge. Although, this drop structure is high priority and an important component of the stabilization measures proposed for Pheasant Branch, the primary focus is structure protection. Therefore, cost-sharing for this expensive measure ($175,000) is not recommended.

Downstream from Century Avenue, substantial improvements are needed to stabilize the stream channel and minimize extensive streambed erosion. Approximately 350 feet downstream from Century Avenue, a channel segment is experiencing considerable shifting and bed (sand) erosion. A length of approximately 500 feet of channel which was rerouted in the early 1970's is severely impacted.

<u>The City of Madison should undertake measures to reduce sediment loss from roadside erosion in the Spring Harbor subwatershed and neighboring areas.</u>

The inventory conducted as part of this plan indicated several potentially significant areas of roadside erosion. These potential sources are: 1) streets without curb and gutter in the Crestwood, Glen Oak Hills, Merrill Crest and Oak Crest plats in the Spring Harbor subwatershed; 2) the bicycle path construction along University Avenue between Whitney Way and Norman Way, and between Baker Avenue and Overlook Pass; and 3) Mineral Point Road widening project between Rosa Road and Yellowstone Drive.

Cost-sharing is recommended for the sites in the Crestwood, Glen Oak Hills, Merrii Crest and Oak Crest plats.

The Village of Waunakee with the assistance of the Dane County SWCD should undertake streambank stabilization on Sixmile Creek.

The inventory of urban lands identified eroding streambanks along Sixmile Creek within the Waunakee urban service area. Cost-sharing is recommended for the control of these eroding banks.

The City of Madison should actively promote redirection of roofdrains away from storm sewers and paved areas where it appears feasible. The portion of the Willow Creek subwatershed shown on the map of urban problem areas should be the initial focus area of this effort.

Mathematical modeling conducted as part of the Dane County Water Quality Plan indicated that control of flow from rooftop areas represents an effective means of reducing the total volume and peak discharge rates of surface runoff from urban areas. In highly impervious areas, rooftops cover a substantial amount of the land surface and tend to contribute greater volumes of flow to the storm sewer system than is the case in lower density areas. While the opportunities for direction of roof drains to grassed and vegetated areas are often limited in higher density development, the potential flow reductions are sizeable. Initially, a fully developed portion of Willow Creek is suggested for redirection efforts since a significant portion of the area is impervious and directly connected to the storm sewer system.

A variety of methods are available to homeowners and commercial establishments seeking to redirect roof drains. Several infiltration approaches are available, and homeowners may also wish to collect rainwater for reuse on vegetable gardens, etc.

Based upon Madison's experience in Willow Creek, a brief assessment should be developed including an evaluation of the advisability of expanding the redirection effort and recommendations as to the feasibility and desirability of codifying downspout redirection requirements. Codification through building codes and ordinances is proposed in the Dane County Water Quality Plan. A simple variance procedure is suggested to deal with cases where basement flooding or excessive wetness is a concern.

The City of Madison should assess the opportunities for installation of infiltration practices, such as infiltration trenches and basins, in the Willow Creek subwatershed and should prepare a brief report on the locations, feasibility, effectiveness and general cost of such facilities in sufficient time for consideration in the 1984 city budget process.

In a fully developed subwatershed such as Willow Creek, opportunities for stormwater management are extremely limited due to: the lack of open space for detention facilities; the extensive impervious surfaces; and the fact that most of the storm sewer system is underground. Thus, on-site infiltration of stormwater provides one of the few means for control of pollutants and stormwater volume. Infiltration provides effective control of particulate and dissolved nutrients.

Part of the assessment should be an identification of rapidly permeable or shallow soils where infiltration practices may not be desirable.

This recommendation specifically addresses practices such as infiltration trenches and basins. Although the number of installations of such practices is limited, the body of literature concerning them is increasing and design criteria are being refined. Possible opportunities for infiltration within the Willow Creek subwatershed include: installation of trenches or basins in open channel portions of the drainage network near Midvale Avenue south of Regent Street and south of Sheboygan Avenue near Regent Street; installation of trenches or infiltration beds along the railroad right-of-way to serve tributary branch storm sewers; and smaller installations to provide for infiltration of runoff from major parking lots.

Cost-sharing for these practices will be considered in the annual reviews of this plan after the report is prepared.

A field test of asphalt porous pavement should be undertaken to evaluate and demonstrate the practicality of this practice for application to parking lots and residential streets within the priority watershed and other areas of Dane County.

Asphalt porous pavement is a promising stormwater management technique which may be applied in both existing and newly developed areas. Like other infiltration measures, porous pavement acts to reduce stormwater flows and associated pollutants, including dissolved nutrients. It offers a significant opportunity for control in older developed areas, where limited open space and an underground stormwater transport system preclude many of the more commonly used practices.

Mathematical modeling conducted as part of the Dane County Water Quality Plan indicated that the infiltration of parking lot runoff in the Willow Creek subwatershed might reduce total runoff volume from the 2-year, 30-minute storm by 20%, and might reduce peak discharges by 23%. Infiltration of street and rooftop runoff yielded additional significant reductions.

Research into porous pavement and the body of available literature on the practice have expanded in recent years, although installation are still very limited in number and geographic distribution. To answer questions about the performance and durability of asphalt porous pavement under Dane County conditions, field tests designed to focus on the utility of the practice for parking lot and residential street use should be implemented. These tests should be conducted over a period of at least three years, and should incorporate monitoring to detect the quality and quantity of filtrate moving through the pavement and into the groundwater.

This plan proposes the establishment of a porous asphalt pavement parking lot of at least 40,000 square feet to serve as an experimental test area to establish the utility of this practice under local conditions.

If porous asphalt pavement proves to be practical and competitive in cost with conventional pavement with drainage facilities, there could be wide application for porous asphalt pavement in new construction throughout the area.

Table 7 Best Management Practice Need and Total Costs for Existing Urban Lands

Best Management Practice		Total Cost All Practices	Total Cost of Practices Recommended for Cost-sharing
Increased Street Sweeping		$ 17,100	
Shorewood Hills	3,700		
Waunakee	13,400		
Alternate Side Parking		41,000	
Madison	35,500		
Middleton	5,500		
Commercial and Institution Parking Lot Sweeping		27,900	
Areas in Madison	26,900		
Areas in Middleton	1,000		
Improved Leaf Collection		11,000	11,000
Madison	9,000		
Waunakee	2,000		
Stream Stabilization		706,300	531,300
Madison	144,000		
Middleton	552,300*		
Waunakee	10,000		
Detention basins			
Madison		33,500	33,500
Critical area (roadside) Stabilization			
Madison		4,700	4,700
Roofdrain redirection			
Madison		7,500	
Infiltration facilities			
Madison		9,400	
Porous pavement			
Madison		60,000	60,000
Subtotal all practices		$918,400	
Subtotal for practices recommended for cost-sharing		$637,300	

* Includes $175,000 for one site where cost-sharing is not recommended.

Recommendations for Developing Lands (Construction Sites) in the Sixmile-Pheasant Branch Watershed

Best Management Practices:

Erosion Control and Stormwater Management Ordinances and Enforcement
Detention Basins
Grade Stabilization Structures
Environmental Corridors

Eroding construction sites are contributing an estimated 28% of the sediment and phosphorus to Lake Mendota from the Sixmile Pheasant Branch watershed. Generally, the sites were stripped of all vegetative cover and had no management practices applied. Although the real extent of construction sites change rapidly and accurate estimates are difficult to calculate, there is little question, construction sites are a significant source of sediment and, in general, local regulatory efforts need to be improved.

In addition as land undergoes development, impervious surfaces such as streets, driveways, roofs, etc. cause the rate and volume of stormwater runoff to increase. Especially in the case of Pheasant Branch Creek through Middleton, the increase in the rate and volume of runoff may increase steambank erosion.

The following recommendations are directed towards controlling sediment and managing stormwater in developing areas.

The City of Madison and the Village of Waunakee should prepare and enact comprehensive construction site erosion and runoff control measures to address the needs identified in this plan.

Due to the extent and severity of construction site erosion within the City of Madison, development and enactment of a comprehensive erosion and runoff control program should be a high if not the highest priority for the City of Madison. Significant development is also anticipated in the near future within the Village of Waunakee. Therefore, development and enactment of a comprehensive program is also recommended for Waunakee. The Village of Waunakee may wish to seek assistance from the Dane County Soil and Water Conservation District in accomplishing technical review of erosion and runoff control plans for new developments.

A comprehensive program should include adequate planning, inspection, and enforcement of erosion and runoff controls for subdivisions, individual residential lots, commercial and industrial projects, streets, and other construction activities. Preparation of such a program should include a review of building codes as well as subdivision and zoning ordinances.

The City of Middleton has adopted and is enacting a comprehensive runoff and erosion control ordinance requiring developers to submit plans for significant land disturbing activities and install practices to minimize erosion and prevent increases in runoff.

Appendix E is a model construction site erosion and runoff control ordinance developed by the Dane County Regional Planning Commission. It is consistent with the approach used in Middleton and represents one approach which may be used. It provides a number of options to meet the differing needs of individual communities.

Since the performance of the proposed detention basins for South Fork Pheasant Branch is dependent on adequate erosion and runoff control on construction sites, it is recommended that the enactment of an adequate erosion and runoff control program for the City of Madison be a condition of cost-sharing of the detention basins.

Dane County should prepare a thorough assessment of the need and means for control of construction site and other significant nonagricultural erosion in unincorporated areas and prepare and present to the Dane County Board; a set of findings and a recommended course of action for the adequate control of such sources. The assessment should be completed no later than January 1, 1983.

Dane County currently has discretion to require preparation and review of an erosion and drainage control plan for all land divisions in unincorporated areas. Review of drainage and erosion control plans requested by the County is undertaken by the Dane County Soil and Water Conservation District. Current regulations apply only to the subdivider and do not address lot-by-lot development, construction of individual homes or commercial developments.

This plan recommends that Dane County prepare an assessment which addresses:

1) the severity and extent of erosion from construction sites (nonagricultural land disturbing activities) in unincorporated areas;

2) the extent to which erosion is adequately controlled;

3) the need and available measures to expand erosion control requirements to include all significant nonagricultural land disturbing activities such as commercial development and utility easements, regardless of whether land division occurs;

4) the desirability and need of measures to allow the County to require runoff control practices, such as detention basins, where deemed necessary;

5) the need to assure that adequate erosion control is practiced in the development of individual lots or construction of individual homes within subdivisions and that the control adheres to the overall erosion plan for the land division, subdivision or planned development; and

6) the need for thorough inspection and enforcement of required improvements. The assessment should first focus on the adequacy of existing County regulations to address erosion and runoff needs and then address alternate mechanisms and institutional arrangements for accomplishing improved erosion control.

Ordinarily, adoption of a general erosion control ordinance to cover all nonagricultural land disturbing activities provides an approach which limits gaps in coverage which may occur where erosion controls are incorporated as part of the subdivision regulations. However, there are questions about the County's authority to adopt such a general ordinance. Amendment of the zoning ordinance to include erosion control standards represents a possible means for erosion control which the county might wish to assess.

The assessment should be coordinated by the Soil and Water Conservation District and completed by January 1, 1983. Other groups invited to participate in the assessment should include: Dane County Zoning Department; Dane County Public Works Department; Dane County Environmental Health (Sanitarian); Dane County Regional Planning Commission; Soil Conservation Service. The recommended course of action should be presented to the Dane County Board by the Soil and Water Conservation District.

Dane County should maintain adequate staff with clearly designated authority for the review of construction site erosion control plans and the inspection of required measures to assure compliance. Adequate provision should also be made for routine continuing inspection of developments in unincorporated areas.

Since few small villages and cities have the administrative capacity necessary to review construction site erosion control plans, this plan recommends that Dane County make arrangements with small units to accomplish technical review of plans.

The City of Madison should construct permanent detention basins in the South Fork Pheasant Branch Creek subwatershed. The detention facilities should provide residence times of at least 24 hours during medium to large storms and should provide for stormwater volume reduction through infiltration, where feasible.

The construction of permanent detention basins in the South Fork of Pheasant Branch Creek Subwatershed is proposed as a necessary component of a long-term control plan for this major developing subwatershed. The proposed detention basins will reduce excessive peak flows which have resulted from rapid growth and development in the watershed and will protect the downstream drainage system. Further, the basins will provide sediment and nutrient reduction benefits during and after the period of urbanization and land conversion in the tributary area. Recent literature (Biggers, et al., 1980) indicates that slow release detention storage facilities of the type contemplated may remove 24-40% of the total phosphorus through sedimentation, but that removal efficiencies may exceed 55% if infiltration facilities are also provided. The City of Madison is encouraged to develop designs for detention basins which achieve the greatest possible sediment and nutrient reductions within the level of expenditure recommended in this plan. The incorporation of detention times greater than 24 hours is encouraged, as is the use of infiltration facilities to reduce runoff volumes and soluble nutrients. Implementation by Madison of the erosion and runoff control ordinance recommended in this plan will complement the proposed detention facilities by providing additional sediment control and by limiting future increases in runoff due to new development.

Spooner Engineering-North, in a 1978 report to the City of Middleton, estimated anticipated increases in discharge from Pheasant Branch Creek subwatersheds west of Highway 12 using a mathematical model and varying assumptions regarding the extent and density of future upstream development. For a South Fork site north of Old Sauk Road and just east of the Beltline Highway, modeling indicated that the 10-year design storm discharge would occur 2.5 to 4 times more frequently after full development. Estimated future peak discharge for the entire South Fork Pheasant Branch under full development and the 25-year, 24-hour storm was given as 920 cfs, a 64% increase over the estimated existing (1977) peak discharge of 560 cfs. The proposed detention storage facilities, in combination with the proposed erosion and runoff control ordinance, should sharply limit, if not negate, these predicted peak flow increases.

The Pheasant Branch Stormwater Management Study (Spooner, 1978) explored the alternatives available to the City of Middleton for stormwater management, including detention. The study concluded that suitable sites for detention basins on the South Fork were not readily available to the City of Middleton and that combined detention storage for the South and North Forks would be prohibitively expensive. Furthermore, areas of sufficient size to handle the flow from both branches or the North Fork alone, appeared limited due to the extremely flat topography of the area immediately west of Highway 12, north of Highway 14, and south of Airport Road. The Spooner report did not evaluate detention alternatives on the South Fork within or immediately adjacent to the City of Madison.

The proposed detention storage facilities included in this plan may be developed as multi-purpose basins to complement park, recreation and open space objectives and serve as integral components of the environmental corridors discussed in this plan. Recommended detention basins should be developed in the near future where they fall within land currently under public ownership or proposed for public acquisition, and should be constructed as land is dedicated in newly developing areas. Cost-sharing is recommended for the construction of the basin, but not for the recreational components.

The first detention basin which incorporates infiltration facilities should include wells for monitoring groundwater levels and quality at various depths under the infiltration bed.

The City of Middleton should discontinue consideration of a proposed sedimentation basin at the entrance to the Pheasant Branch Marsh, if the upstream detention basins, sediment control, and stream channel and bank stabilization measures recommended in this plan are implemented.

A sedimentation basin at the entrance to the Pheasant Branch Marsh was proposed in 1980 (Spooner Engineering-North, 1980) as a means to prevent much of the sand and some of the finer materials carried in the stream from being deposited in the marsh or delivered to Lake Mendota. The sediment basin was proposed as a means to gain limited water quality benefits, but more importantly, to provide for more convenient management of the delivered sand and silt and for long-term protection of the marsh.

The Spooner report (1980) estimated an overall trap efficiency of about 37% for a basin design presented to the City of Middleton. Trapped sediment was estimated to be composed of 26% sand, 67% silt and 7% clay by weight, on an average basis. The phosphorus trapping efficiency of the sedimentation basin would be limited, since a high percentage of the total phosphorus is dissolved or associated with the clay and fine silt particles. The estimated total construction cost of the conceptual sedimentation basin design presented to Middleton was $207,000, in November 1979 dollars. In addition, there would be an annual cost for maintenance of $8,000.

The sedimentation basin proposal for Pheasant Branch Creek was made in the absence of recommendations for comprehensive streambank and bed stabilization, and under the assumption that the establishment of significant upstream detention would be infeasible due to the lack of suitable detention sites within Middleton's jurisdiction.

The Village of Waunakee should undertake the development of detention basins. These basins should be developed at the appropriate time, as determined by the extent of development, and maintained as public facilities. Their approximate locations should be indicated on the Village's official map as soon as feasible.

The Village of Waunakee has recognized the need to develop detention basins at the approximate locations indicated on the map of recommended urban control measures. These basins would serve to limit the adverse water quality impacts of land conversion and urban development in the Village upon Sixmile Creek, and would provide continuing water quality benefits after the period of development. The proposed detention basin locations are beyond the current village limits of Waunakee, but within the area of anticipated development for the next 5-10 years.

The detention basins proposed for Waunakee should be specifically designed to provide the greatest water quality benefits attainable within the levels of expenditure recommended in this plan. Detention times of greater than 24 hours should be provided, and infiltration should be encouraged to the greatest extent possible.

Since the proposed detention basins are considered to be supplemental and not primary water quality control practices for developing portions of the Waunakee urban service area and are not proposed as a substitute for general construction site erosion control, it is recommended that Waunakee enact a construction site erosion control ordinance as a prerequisite to the receipt of cost-sharing money for detention basin development.

The designated management agencies in the Sixmile-Pheasant Branch Watershed should take necessary actions, as opportunities arise, to protect and preserve the lands within the environmental corridors shown on the map of recommended urban control measures. These lands should be protected primarily through regulatory or legal mechanisms, or dedication should be sought during the development process. Acquisition should be considered primarily where public ownership would further important community objectives, such as provision of adequate park and open space opportunities or necessary urban services and facilities.

The environmental corridors depicted on the map of urban control measures consist of resource based environmentally sensitive lands and those lands necessary for the continued future protection of the natural drainage system and water resources. The potential for deterioration of water quality and for damage to integrated environmental systems exists if these sensitive areas and resources are not protected. Establishing mechanisms to protect and preserve the lands and resources within the environmental corridors is especially important in those large areas of the Sixmile-Pheasant Branch Watershed subject to urbanization during the 20-year period covered by the Dane County Water Quality Plan.

Maintenance or establishment of vegetative cover within the environmental corridor creates a buffer zone which serves to attenuate overland flow to the water body or drainageway, and reduces the delivery of sediment and associated pollutants. In addition, waterways are afforded a measure of protection from accelerated bank and channel erosion which may be due to increased upland development or to poor or negligent land management practices. The protection of environmental corridors in urbanizing areas also preserves stormwater management options which may be exercised during the land conversion process, and reserves sufficient land area to provide for incorporation of natural stormwater management and drainage facilities at the time of development. The official designation of the corridor provides a guide for dedication of lands during the platting process.

Several means and levels of protection for environmental corridors are indicated below. While the use of methods other than acquisition is strongly encouraged, the choice of method rests primarily with the designated management agencies as does the evaluation of the long-term public value of the land in question. In many cases, conservancy zoning or the granting of easements may be sought to provide for immediate protection, while land dedication or acquisition are targeted as long-range objectives to be met at the time of land development.

The following measures are recommended for the environmental corridors shown on the map of recommended urban control measures:

- The Cities of Madison and Middleton should officially map as "parkway" those environmental corridor reaches not already designated as such;
- Local plans should be amended or developed to reflect the presence of the environmental corridors;
- Conservancy zoning of environmental corridor lands should be promoted and sought, where public access to corridor lands is not needed;
- Madison, Middleton and Waunakee should seek conservation or public easements and/or land dedication as appropriate particularly where public access is desired; and
- High value resources which are targeted for eventual public aquisition should be afforded appropriate levels of short and mid-term protection (such as official mapping, zoning, and easement acquisition) and acquired through dedication or purchase at the appropriate time.

Other measures that can be used include: acquisition of fee title including various forms of purchase, trade, dedication and gift as well as acquisition of less than fee including purchase of conservation, public and scenic easements, purchase of development rights, and similar methods. Regulatory mechanisms including zoning are also appropriate. The choice of measures to be used for protection of environmental corridor segments should consider among other things, the public objectives for the land in question, the value of the land as a public resource, and the immediacy of any threat to the environmental corridor lands.

Additional recommendations and further discussion of specific segments of the environmental corridor system are included in Appendix D.

Table 8 Best Management Practice Need and Total Costs for Developing Areas

Best Management Practices	Total Cost All Practices	Total Cost of Practices Recommended for Cost-sharing
South Fork Pheasant Branch Detention Basins	$280,100*	$154,100
South Fork Pheasant Branch Grade Stabilization Structures	28,800	28,800
Waunakee Detention Basins	70,000	70,000
Subtotal	$318,900	$252,900

*An estimated $126,000 in land acquisition costs is not eligible for cost-sharing.

Table 9 - Summary of Costs for Best Management Practices

	Total Cost of All Practices	Total Cost of Practices Recommended for Cost-sharing
Croplands and other rural lands	$1,618,795	$1,618,795
Barnyard runoff control		
-without above ground tanks	$ 572,000	$ 572,000
-with above ground tanks	[$1,272,000]	[$1,272,000]
Existing urban areas	$ 918,400	$ 637,300
Developing areas	$ 378,900	$ 252,900
Total-without above ground tanks	$3,488,095	$3,080,995
Total-with above ground tanks	$4,188,095	$3,780,995

Expected Results

Implementation of this plan will result in a substantial decrease in the sediment reaching the harbors and shallow areas of Lake Mendota within the watershed boundaries. The percent reduction in sediment is difficult to quantify. Generally, installation of the recommended best management practices on croplands will reduce the overall soil loss within the priority management area by 50-75%. Reductions in sediment reaching Lake Mendota should be slightly less. Erosion control on construction sites and existing urban areas and sediment trapping in detention basins could reduce the sediment by about 50%. Sediment reduction from barnyards should probably be in excess of 50%. Assuming a participation level of 75%, the expected reduction in sediment to Lake Mendota from the Sixmile-Pheasant Branch Watershed should be roughly 40%.

PROGRAM FOR IMPLEMENTATION

Introduction

The detailed program for implementation identifies:

(1) tasks necessary to implement the Sixmile - Pheasant Branch Priority Watershed Plan;

(2) agencies and units of government responsible for carrying out those tasks;

(3) the time frame for carrying out the tasks; and

(4) the kind and amount of staff and other resources needed to carry out the tasks.

The detailed program for implementation was developed assuming the watershed project will receive at least partial funding from the Wisconsin Nonpoint Source Pollution Abatement Program (Wisconsin Fund). Therefore, it is designed to meet the requirements of NR 120, Wisconsin Administrative Code. Funding from other sources may necessitate revisions to this implementation strategy.

The detailed program for implementation guides the designated management agencies in performing their role. Specific record keeping requirements are found in NR 120, Wis. Adm. Code and examples of forms issued are published in "Preparing your Implementation Program" and are not included in this summary. Where financial assistance is needed to carry out the tasks, a Local Assistance Agreement will be developed with the Department of Natural Resources. The estimates in this strategy will be reviewed annually based on implementation progress and a new Local Assistance Agreement will be developed after the annual review.

Potential Funding

In 1978, the Wisconsin Legislature created the Wisconsin Nonpoint Source Water Pollution Abatement Program as part of the Wisconsin Fund. The purpose was to aid individuals and municipalities in implementing nonpoint source controls within selected geographic areas. The majority of the monies appropriated are to be used in priority watershed projects such as Sixmile - Pheasant Branch Watershed Project. In addition, the Legislature has instructed the Department of Natural Resources to select projects, develop plans for these projects, and seek federal funding for implementation of the plans. In essence, this plan and, to the extent appropriate, this program for implementation serves as the basis of an application for federal funding.

The federal funding sources potentially available are:

PL-566 Small Watershed Program - Soil Conservation Service

Clean Lakes (Section 314 of PL 92-500) - Environmental Protection Agency;

Rural Clean Water Program - Agricultural Stabilization and Conservation Service; and

Agricultural Conservation Program - Agricultural Stabilization and Conservation Service.

In 1975, a PL-566 application was made by the Dane County Soil and WAter Conservation District (SWCD) for the Pheasant Branch portion of the watershed. Recently the project application was modified to add the Sixmile Creek drainage area. Presently, Dane County SWCD is receiving funding from the PL-566 program for nonpoint source control installation in the Upper Sugar River Watershed. All of the best management practices in the rural areas and most, if not all, of the best management practices in the urban areas are potentially eligible for cost-sharing under this program. The Dane County SWCD will have to make a request to the Soil Conservation Service to have the project considered for funding.

Wisconsin has been fortunate to receive funding for a number of lake rehabilitation and protection projects from the Clean Lakes Program administered by EPA. All best management practices recommended in this plan are potentially eligible. Annually, the Department of Natural Resources ranks potential projects and submits applications to EPA. Limits to funding under this program would probably require a combination of Clean Lakes, Wisconsin Fund, and landowner cost-sharing. Future funding for the Clean Lakes Program is uncertain at the time this plan was prepared.

The Rural Clean Water Program is a two-year experimental program. Currently, the Lower Manitowoc River Priority Watershed Project is funded partially out of the Rural Clean Water Program and partially out of the Wisconsin Fund. Wisconsin projects submitted during the second program year were not selected. All projects are submitted to the National Coordinating Committee by the State Agricultural Stabilization and Conservation Committee with advice of the multi-agency State Coordinating Committee. Future funding for this program is uncertain at the time this plan was prepared. Potentially, rural best management practices recommended in this plan would be eligible but the practices within urban areas would not.

The Agricultural Conservation Program has made special project grants for a number of years - including one project within the Sixmile - Pheasant Branch Watershed. Special project grants made from state allocations generally have been in amounts no greater than $40,000. However, special project grants made at the national level have for Wisconsin Projects been up to $150,000. Only practices in rural areas would be eligible. Application for funds would have to be made through the Dane County Agricultural Stabilization and Conservation Committee.

Designated Management Agencies

Designated Management Agencies (DMA's) are those local agencies or units of government identified in the Dane County Water Quality Plan as having responsbility for coordinating plan implementation efforts at the local level. The Dane County Board and the Dane County Soil and Water Conservation District were jointly identified to serve as DMA's for implementation activities on agricultural and other rural lands and construction activities outside of incorporated areas. Within incorporated areas, the Cities of Madison and Middleton and the Villages of Waunakee and Shorewood Hills were identified for nonpoint source control activities within existing urban areas and construction site erosion control activities within their jurisdictions.

Each priority watershed project has a lead designated management agency (LDMA) and the Dane County Soil and Water Conservation District will carry out that role for this project. The LDMA is responsible for coordinating activities among all other DMAs in the watershed. The LDMA is contractually and financially responsible to the State of Wisconsin for overall management of the project. Responsibilities of the DMAs and LDMA are listed in Chapter NR 120.06 of the Wisconsin Administrative code and discussed in the following sections.

Besides the designated management agencies, a number of other agencies are integrally involved in the program and mentioned frequently in this program for implementation. They are:

Soil Conservation Service - The Soil Conservation Service (SCS) working through the Dane County Soil and Water Conservation District, will provide staff for planning, designing, installing, supervising and certifying the construction of best management practices.

University of Wisconsin-Extension - Dane County Extension agents will provide expertise in planning, coordinating, and conducting public information, education, and participation efforts including development of watershed tours, workshops, and newsletters and contacts with the landowners.

Dane County Regional Planning Commission - The Dane County Regional Planning Commission (DCRPC) is the designated water quality planning agency for Dane County and is responsible for coordinating and integrating the watershed plan with the Dane County Water Quality Plan.

Department of Natural Resources - The Department of Natural Resources (DNR) has overall administrative responsibility for the Wisconsin Nonpoint Source Water Pollution Abatement Program. DNR is responsible for allocation of funds to the project, for water quality monitoring, and for evaluation and approval of the watershed plan.

Implementation Schedule

The Wisconsin Fund program requires (1) all implementation activities to be initiated within three years of the signing of the Nonpoint Source grant agreement with the DNR and (2) all work completed within five years of the signing of the cost-sharing agreements. The phasing of the implementation of projects represents an estimate of both the relative priorities of recommended actions and the readiness of the management agency to proceed with an action. For example, several of the recommended detention basins in the South Fork of Pheasant Branch cannot be constructed immediately since land acquisition is necessary, or the development of an area and concurrent opportunities for detention basin development are not expected to occur for several years. In addition, completion of actions of lower priority are scheduled for the last three to four years of the plan implementation period. The table below details the schedule for urban and developing areas.

Streambank and channel stabilization projects and detention basin development represent the two major areas of capital expenditures in the urban nonpoint source control plan. For these measures, individual projects have been assigned general priorities based on the apparent severity of the problem addressed, the immediacy of the need for remedial action, the perceived water quality benefits of the proposed action, and the location of the action. Structural measures proposed for the Village of Waunakee have been assigned medium priority due to the lower priority assigned to Sixmile Creek in this watershed plan. Certain streambank stabilization measures on Pheasant Branch Creek in the City of Middleton have been assigned medium priority.

The following order of initiation of activities and areas is based on the apparent severity of the problems as well as the willingness and capability of the management agency to carry out the effort. The order is a guide for focusing primary efforts and will be reassessed annually.

Dane County SWCD and County

First Year Focus

* Cropland and other rural land and barnyard runoff needs in -

  South Fork Pheasant Branch subwatershed
  North Fork Pheasant Branch subwatershed
  Middle and Lower Pheasant Branch subwatershed

* Contruction site erosion control assessment in unincorporated areas.

Second Year Focus

* Croplands and other rural land and barnyard runoff needs in -

  Above Waunakee Marsh subwatershed
  Direct drainage to Lake Mendota

Third Year Focus

* Cropland and other rural land and barnyard runoff needs in -

  Below Waunakee Marsh subwatershed
  Spring Creek subwatershed

City of Madison

First Year Focus

* Construction site erosion control and stormwater management assessment

* Spring Harbor subwatershed streambank stabilization and stormwater detention practices

Second Year Focus

* Implementation of construction site erosion control and stormwater management

* South Fork Pheasant Branch stormwater management and grade stabilization practices

Third Year Focus

* Willow Creek subwatershed stormwater management assessment and practices

City of Middleton

First Year Focus

* Pheasant Branch Creek high priority streambank stabilization practices

Second Year Focus

* Continuation of Pheasant Branch Creek high priority streambank stabilization practices.

Third Year Focus

* Pheasant Branch Creek medium priority streambank stabilization practices.

SCHEDULE OF IMPLEMENTATION, PRIORITIES AND COSTS FOR URBAN NONPOINT SOURCE ABATEMENT MEASURES*

PROPOSED MEASURE	MANAGEMENT AGENCY	PRIORITY	1982	1983	1984	1985	1986	1987	1988	1989
Construction Erosion and Runoff Control	City of Madison		(24,600)	X	X	X	X	X	X	X
	Village of Waunakee			(4,100)	X	X	X	X	X	X
Increased Street Sweeping	Village of Waunakee			(13,400)[3]	X	X	X	X	X	X
	Village of Shorewood Hills			(3,700)	X	X	X	X	X	X
Increased Leaf Collection	City of Madison			9,000	XX	XX	XX	XX	XX	X
	Village of Waunakee			2,000	XX	XX	XX	XX	XX	X
Alternate Side Parking	City of Madison				$(35,500)	X	X	X	X	X
	City of Middleton				(5,500)	X	X	X	X	X
Roadside Erosion Control	City of Madison		1,500[1] (3,200)							
Roofdrain Redirection	City of Madison		(7,500)[2]							
Commercial & Institutional Parking Lot Sweeping	City of Madison			(26,900)[3]	X	X	X	X	X	X
	City of Middleton			(1,000)[3]	X	X	X	X	X	X
Porous Pavement Field Test	City of Madison			60,000						
Infiltration Facilities	City of Madison		(9,400)[2]							
Detention Basins	City of Madison	High Medium	19,100[4]	20,200[5] 14,400[6]	105,100[7]	$(66,000)[8] 11,500[9]	$(60,000)[10]	$ 17,300[11]		
	Village of Waunakee	Medium				30,000	40,000			
Stream Stabilization	City of Madison		144,000[12]			14,400	14,400			
	City of Middleton	High Medium		120,200[13]	35,100[14] (175,000)[15]	47,700[14]	40,100[14]	44,800[14]	44,700[14]	$44,700[14]
	Village of Waunakee	Medium			7,000[16]	3,000[16]				
Public Education - Madison	City of Madison		(17,500)	X	X	X	X	X	X	X

*Costs are initial capital costs or operation and maintenance costs for first year of practice. Costs in March 1981 dollars. Ineligible costs shown in parentheses.

X = Continuing practice (non-structural measures).
XX= Period of mandatory practice maintenance for non-structural measures. Structural measures must be maintained through or beyond plan implementation period.

[1]Maintenance required under Wisconsin Fund.
[2]Feasibility Study
[3]Not eligible unless frequency exceeds 1x/2 weeks.
[4]Owen-Jetty detention basin.
[5]Walnut Grove detention basin.
[6]Owen-South Hill detention basin.
[7]Wexford detention basin.
[8]Middleton Junction - north land. } High Priority
[9]Middleton Junction - north detention basin. } High Priority
[10]Middleton Junction - south land.
[11]Middleton Junction - south detention basin.
[12]Owen Park main channel stabilization.
[13]Channel lining north of Century Avenue
[14]Pheasant Branch streambank projects - Century Avenue to Highway 12.
[15]Century Avenue drop structure.
[16]Sixmile Creek Streambank - Village of Waunakee.

Village of Shorewood Hills

First Year Focus

-

Second Year Focus

* Increased street sweeping

Third Year Focus

-

Village of Waunakee

First Year Focus

-

Second Year Focus

* Construction site erosion control and stormwater management program revision

Third Year Focus

* Stormwater management structures

Project Manager

The Dane County SWCD Coordinator will be the Project Manager and will serve as a liaison between the state and federal agencies involved in the program and the DMAs. The Project Manager will monitor contracts between DMAs and other agencies, organizations, and individuals within the implementation program. The Project Manager's responsibilities include: managing finances, supervising project staff, coordinating technical assistance and information and educational activities. The Project Manager is the official agent of the LDMA and is directly accountable to it.

It is estimated 4,000 hours of time will be needed for program management over seven years. The hours are broken out by activity and year in the following table:

Estimated Hours of Program Management Required for Implementation

Activity	1982	1983	1984	1985	1986	1987	1988	Total Hours
Information & Education	300	250	200					750
Coordinating Meeting	300	300	300	250	200	150	100	1,600
Annual Program Meeting	35	35	35	35	35	35	35	245
Staff Coordination	100	100	100	75	75	50	50	550
Coordination with DNR	100	100	100	100	75	50	50	575
Management of Cost-share Funds	15	15	15	15	15	15	15	105
Management of Impl.	20	20	20	20	20	20	20	140
Totals	870	820	770	495	420	320	270	3,965

Technical Assistance

Technical assistance activities include: contacting landowners and land users; assessing site needs; developing cost-sharing agreements; designing best management practices; supervising installation of practices; certifying completion of practices; and inspecting operation and maintenance of practices.

In rural areas, the Dane County Soil and Water Conservation District is responsible for providing the technical assistance and is aided by the Soil Conservation Service. The table that follows shows estimates of the number of hours for each task or practice, by year, based on the best management practice needs identified in this plan, general work rates for each practice, and a 75% participation rate. An estimated 14,900 hours of technical assistance is needed over seven years. Much of the assistance can be provided by existing staff. Additional staff needs will probably be met through a contract with the Soil Conservation Service and are potentially eligible for reimbursement from the Local Assistance Aids portion of the Wisconsin Nonpoint Source Water Pollution Abatement Program. The specific state and local shares will be developed as part of the Local Assistance Agreement between DNR and the Dane County SWCD, the LDMA, and revised annually based on completed tasks during the year, revised practice rates and available fundings.

Estimated Hours of Technical Assistance Required for Implementation
Based on 75% Participation Level

Activity	Rate/Unit	1982	1983	1984	1985	1986	1987	1988	Total
Landowner Contacts	2 hr/ea.	250	250	100					600
Planning with DMA's	-	200	150	150					500
Conservation Planning	.4 hr/Ac	1620	1614	1614					4,848
Cost-Share Agreements	8 hr/ea	304	304	296					904
Revision of Agreements	4 hr/ea	-	8	8	16	8	8	-	48
Contour Farming	.3 hr/Ac	-	2	7	113	90	23	20	255
Contour Strip Cropping	.3 hr/Ac	-	7	7	337	337	180	34	902
Diversion	.02 hr/ft	-	-	-	1	-	-	-	1
Terraces	.01 hr/ft	-	37	37	450	450	375	297	1,646
Waterways	20 hr/Ac	20	40	40	300	300	220	140	1,060
Minimum Tillage*	-	-	5	15	30	30	30	10	120
Critical Area Stab.	4 hr/Ac	-	-	-	16	16	16	12	60
Grade Stab. Structure	55 hr/ea	-	55	55	110	165	110	-	495
Shoreline Protection									
Fencing	.05 hr/ft.	27	27	27	27	27	27	27	189
Shaping & Seeding	.05 hr/ft	26	26	26	26	26	26	26	182
Riprap	.05 hr/ft	-	2	4	11	10	6	2	35
Livestock Crossing	6 hr/ea	6	6	6	6	6	6	6	42
Animal Waste Runoff Control	40 hr/ea	240	240	280	760	400	400	320	2640
Livestock Excl. From Woodland	.3 hr/ea	2	2	3	6	11	2	2	28
Annual Review of BMP's	1 hr/ea	-	12	28	56	75	94	113	378
Totals		2,695	2,787	2,703	2,265	1,951	1,523	1,009	14,933

*Intended primarily to cover problems with weeds or disease potentially associated with minimum tillage

In incorporated areas, the cities and villages are responsible for designing practices and supervising installation. They will use either existing staff or hire consultants. The Dane County SWCD will develop cost-sharing agreements with the cities and villages and certify completion of practices. Part of the technical assistance activities within incorporated areas may be eligible for reimbursement from state funds. As with the rural areas, the specific state and local shares will be developed as part of the Local Assistance contract and revised annually.

Chapter NR 120, Wisconsin Administrative Code requires the practice standards and specifications and design criteria available in the SCS Technical Guide to be used except:

(1) where less restrictive design criteria will achieve the same level of control, and

(2) where the practice is not included in the Technical Guide.

The design criteria for practices not in the Technical Guide must be approved by DNR. A number of urban stormwater management practices recommended in this plan may not be included and will require DNR approval.

Fiscal Management

The Dane County SWCD acting as the LDMA will be directly responsible for fiscal management of all cost-sharing and local assistance monies. They will handle the bookkeeping activities with assistance from the County Comptroller. Specific record keeping requirements are identified in Chapter NR 120, Wisconsin Administrative Code.

The best management practices within incorporated areas will be handled similarly to working with individual landowners and land users. After practice completion and certification, the cities and villages will submit vouchers to the Dane County SWCD documenting practice costs as well as documentation of cost-estimates of at least cost and practical alternatives. All cost sharing in rural as well as urban areas must be based on the cost estimate of the least cost, practical alternative.

It is estimated, about 1,100 hours will be required for fiscal management over seven years.

ESTIMATED HOURS FOR FISCAL MANAGEMENT

Activity	Rate/Unit	1982	1983	1984	1985	1986	1987	1988	Total Hrs
Recording of Cost-Share Agreement	3 hr/ea	15	15	15					45.0
Maintain Total Allocation Ledger	.25 hr/ea	12.5	12.5	12.5					37.5
Project Completion Ledger	.2 hr/ea	10.0	10.0	10.0					30.0
Issuance of Referral	.25 hr/ea	5.0	11.25	17.5	27.5	20.0	12.5	6.25	100.0
Recording of Practice Certification	.5 hr/ea	10.0	22.5	35.0	55.0	40.0	25.0	12.5	200.0
Preparation of Payment Vouchers	.25 hr/ea	5.0	11.25	17.5	27.5	20.0	12.5	6.25	100.0
Prep. of Agreement Form for Approval	.25 hr/ea	12.5	12.5	12.5					37.5
Filing of Plan and Contract	.25 hr/ea	12.5	12.5	12.5					37.5
Service of Referral	.25 hr/ea	5.0	11.25	17.5	27.5	70.0	12.5	6.25	100.0
Preparation of Referral for DMA Approval	.25 hr/ea	5.0	11.25	17.5	27.5	20.0	12.5	6.25	100.0
Collection of Referral & Receipts	.25 hr/ea	5.0	11.25	17.5	27.5	20.0	12.5	6.25	100.0
Prepare Check	.25 hr/ea	5.0	11.25	17.5	27.5	20.0	12.5	6.25	100.0
Internal Audit	.25 hr/ea	5.0	11.25	17.5	27.5	20.0	12.5	6.25	100.0
Totals		107.5	163.75	220.0	247.5	180.0	112.5	56.25	1087.5

Information and Education

To reach 230 farm owners, over 57,000 urban dwellers, and land developers in the Sixmile-Pheasant Branch Watershed, the information and education program must be comprehensive and piggy-back on ongoing activities, such as the University of Wisconsin-Extension's education efforts and the Dane County Regional Planning Commission's areawide water quality plan implementation activities, wherever possible. The efforts are aimed at farm operators, absentee farm owners, urban dwellers, elected officials, and developers. The intent of this information and education program is to effectively reach and communicate with all important audiences and actors in the watershed. A mixture of one-on-one contacts, mass media, direct mailings, tours, demonstrations, and displays are included.

The information and education efforts will be carried out by University of Wisconsin-Extension, Dane County Soil and Water Conservation District, Dane County Regional Planning Commission, City of Madison, and City of Middleton. Assistance will be provided by Soil Conservation Service and Department of Natural Resources. Activities in Madison will be coordinated with the Madison Commission on the Environment and in Middleton with the Water Resources Management Commission.

Target Audience - General Public

	Method	Frequency	Coordinating Agency
1.	Media		
a.	newspaper articles	12/year	SWCD/UW-EXTENSION/RPC
b.	radio programs	12/year	UW-EXTENSION
c.	television programs	2 features/yr.	UW-EXTENSION
d.	personal columns	monthly	UW-EXTENSION
a.	RPC newsletter articles	4/year	RPC
b.	brochures	two	UW-EXTENSION/RPC
c.	school meetings	6/year	UW-EXTENSION
d.	presentations to service organizations	3/year	UW-EXTENSION/RPC
3.	Displays		
a.	shopping centers, banks Parade of Homes	20 sites/yr.	UW-EXTENSION
b.	construction site erosion control	10 sites/yr.	RPC
4.	Tours		
a.	RPC annual tour	1/yr.	RPC
b.	watershed tour	1/yr.	RPC/UW-Ex/SWCD

In addition to those activities aimed at the general public, the following efforts are directed at specific audiences:

Target audience - Farmers, rural landowners

Method	Frequency	Coordinating Agency
1. Media		
a. ASCS, 4H newsletters articles	4-8/year	UW-EXTENSION
2. Direct mailing		
a. newsletters	2-4/year	UW-EXTENSION
b. questionnaires	1/year	SWCD/UW-EXTENSION
3. Tours and demonstrations		
a. manure management	1/year	UW-EXTENSION
b. pasture renovation	1/year	UW-EXTENSION
4. Individual contacts (part of technical assistance)		
a. farm visits	10-20/year	UW-EXTENSION
b. practice maintenance assistance	5-30/year	UW-EXTENSION

Target audience - urban dwellers and city officials

Method	Frequency	Coordinating Agency
1. Media		
a. public service announcements	weekly during August and September	RPC/Madison/Middleton
2. Direct mailing		
a. leaf collection and disposal reminder (possibly mailed with water bills)	1 time/yr.	RPC/Madison/Middleton
3. Displays		
a. placards and brochures at hardware, garden supply and grocery stores	1-2 times/yr.	Middleton/RPC/Madison

The very successful water conservation program of the Madison Water Utility serves as a model for information and education efforts aimed at improving street sweeping and leaf collection practices.

Target audience - developers and officials

Method	Frequency	Coordinating Agency
1. Workshops		
a. annual contractor's workshops	1/year	SWCD
b. construction erosion and run-off control sessions	1/year	SWCD/RPC
2. Demonstrations		
a. porous pavement, infiltration facilities	1/year	RPC
3. Individual contacts		
a. provide information to developers	as necessary	UW-EX
b. ordinance development		RPC

Information and education goals

Product estimates	Project Year 1	2	3	4	5	6	7	Total
Newspaper articles	12	12	12	3	3	3	3	48
Radio programs	12	12	12					36
Television programs	2	2	2		1		1	8
Newsletters	4	4	4	2	2	2	2	10
Brochures	3							3
Questionnaire	1	1		1				3
School meetings	6	6	6					18
Service organizations	3	3	3					9
BMP workshops	1	2	2					5
Tours	1	2	2					5
BMP demonstrations		1	2					3
Individual contacts	6	6	6					18

Cost-sharing Agreements

Chapter NR 120, Wisconsin Administrative Code requires all cost-shared as well as non-cost-shared practices necessary to meet this plan's objectives be included on the cost-sharing agreement. The plan has identified, for example, an adequate construction site erosion and runoff control program and the proposed detention basins on the South Fork Pheasant Branch as integral comments. Therefore, a cost-sharing agreement with the City of Madison covering that subwatershed should include both the detention basins and the construction site erosion and runoff control.

Cost-sharing agreements covering practices within a city's or village's limits may be written separately for each subwatershed. For example, one cost-sharing agreement may cover Spring Harbor Creek Subwatershed and another South Fork Pheasant Branch Subwatershed.

Assessment Review

The plans for all priority watershed projects require periodic review and possible revision. This is especially true for the Sixmile - Pheasant Branch watershed plan since several important problem and feasibility assessments are recommended. Plan revisions require approval by the LDMA and DNR. Approval by other DMA's is also desired but not required.

Review committees should be set-up for each assessment recommended in this plan. The purpose of these committees is to review the assessment, advise the DMA coordinating the assessment on implementation direction and advise the LDMA and DNR on approval of the assessment and revision of the watershed plan. The membership of the review committee will be determined by the DMA with assistance from the LDMA.

Annual Review and Audit

Annually, the designated management agencies, the Dane County Regional Planning Commission, and the Department of Natural Resources will meet and review the needs and recommendations in the plan and the program for implementation in light of implementation progress during the first year. A progress report should be prepared. Necessary revisions should be made and the approval process will be the same as the original approval of the plan.

Chapter NR 120, Wisconsin Administrative Code, requires the Department of Natural Resources to conduct periodic fiscal and performance audits. The fiscal audit involves the inspection of the bookkeeping records listed in Section NR 120.06(5) such as accounting records showing: all receipts, encumberances, expenditures, and fund balances and a complete file on each cost-sharing agreement file including: documentation of least cost determination and practice completion certification. If monies were spent in a manner inconsistent with Section 144.25, Wisconsin Statutes or NR 120, Wisconsin Administrative Code, the lead designated management agency is responsible for reimbursing the Department of Natural Resources.

The performance audit reviews: best management practice consistency with the needs identified in the plan; on-site practice installation; and progress relative to the schedule identified in the program for implementation. The results of the performance audit will be: an identification of tasks where progress is adequate as well as those where progress is inadequate and recommendations for changes in the program for implementation. If progress is significantly inadequate, the Department may curtail granting cost-sharing or local assistance monies for the entire project, for a particular political or geographic area, or for a particular task.

Appendices

Appendix A: Cost-sharing under Wisconsin Nonpoint Source Water Pollution Abatement Program

Appendix B: Rural Best Management Practice Summary by Subwatershed

Appendix C: Urban Inventory Summary

Appendix D: Environmental Corridors

Appendix E: Model Construction Site Erosion and Runoff Control Ordinance

Appendix F: Monitoring and Evaluation

Appendix A

Cost-sharing under the Wisconsin Nonpoint Source Water Pollution Abatement Program

This appendix contains estimates for cost-sharing dollar needs, special provisions for above ground tanks for collecting barnyard runoff, and cost-sharing conditions. All cost-sharing estimates are based on a 75% participation level.

Cropland and other rural lands -

Activity	Units needed	Unit Cost	Total Cost	Cost-sharing %	Cost-sharing
Contour Farming	847/Ac	$16/Ac	$ 13,560	50	$ 6,780
Contour Strip Cropping	3,007/Ac	$18/Ac	54,135	50	27,068
Diversions	8,137/Ac	$ 3/ft	24,413	70	17,089
Terraces	164,700/ft	$ 3/ft	494,100	70	345,870
Waterways	53/Ac	$3,385/Ac	179,405	70	125,584
Minimum Tillage	3,195/Ac	$90/Ac	287,550	50	143,775
Critical Area Stab.	15/Ac	$500/Ac	7,500	70	5,250
Grade Stab. Structure	9	$10,000/ea	90,000	70	63,000
Shoreline Protection					
Fencing	3,750/ft	$1/ft	3,750	70	2,625
Shaping & Seeding	3,562/ft	$6/ft	21,377	70	14,960
Riprap	698/ft	$18/ft	12,600	70	8,820
Livestock Crossing	$ 4,500/ea		23,625	70	16,538
Livestock Excl. From Woodland		$40/Ac	3,760	70	2,637
Subtotal			$1,215,775		$779,996

Barnyards -

Activity	Unit Cost	Total Cost	Cost-sharing %	Cost-sharing
Barnyard runoff control	$ 6,500	$429,000	70	$300,300
Above ground tanks	$35,000	525,000	70	$367,500

For purpose of budgeting, above ground tanks will not be included.

The following special provisions apply to the above ground tanks:

1. A cost-sharing ceiling of $25,000 per unit will apply;

2. A cost-effectiveness and technical feasibility analysis will be done on each site prior to entering into a cost-sharing agreement for the site; and

3. Cost-sharing will be based solely on the portion of the volume for barnyard runoff control, if the tank is also used for manure storage.

Existing urban lands -

Activity	Total Cost	Cost-sharing %	Cost-sharing
Improved leaf collection	$ 8,250	50	$ 4,125
Streambank stabilization	$398,475	70	$278,933
Detention basins	25,125	70	17,588
Porous pavement	45,000	70	31,500
Critical area stabilization	1,125	70	787
Subtotal	$477,975		$332,933

Developing lands

Activity	Total Cost	Cost-sharing %	Cost-sharing
Detention basins	$168,075	70	$117,653
Grade stabilization structures	21,600	70	15,120
Subtotal	$189,675		$132,773

Grand Total $1,546,002

C1 Contour Cropping

Maximum cost-share rate _____
or flat rate per acre _____

Definition - Farming sloped land so all cultural operations from seed bed preparation to harvest are done on the contour.

Conditions:

1. Cost-sharing is limited to establishment of a contour farming system and the removal of obstacles, where applicable.

2. All agricultural operations must be performed as nearly as practicable on the contour.

3. To the extent practical, on acreage devoted to rowcrops:

   a) A crop stuble or residue must be left on the surface over the winter;

   b) A winter cover crop must be established; or

   c) Protective tillage operations must be performed.

4. The contour cropping system must be maintained for 5 years after the year of establishment.

Specifications: SCS technical guide specifications 330 and 344

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C2 Strip cropping

Maximum cost-share rate _____
or flat rate per acre _____

Definition: Growing crops, usually on the contour, in alternated strips of close growing crops, clean tilled row crops, and grass-legumes.

Conditions:

1. Cost-sharing is limited to establishment of the strip-cropping system and, if necessary, removal of obstacles.

2. All cultural operations must be performed as nearly as practicable on the contour.

3. To the extent practical, on acreage devoted to row crops:

   a) A crop stuble or residue must be left on the surface over the winter;

   b) A winter cover crop must be established; or

   c) Protective tillage operation must be performed.

4. The strip cropping system must be maintained for 10 years after the year of establishment.

Specifications: SCS Technical Guide specifications 585A, 585B, 585C

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C3 Diversions Maximum cost-share rate _____

Definition: Structure installed to divert water from areas where it is in excess to sites where it can be used or transported safely. Usually the system is a channel with a supporting ridge on the lower side constructed across the slope at a suitable grade.

Conditions:

1. An adequate outlet must exist.

2. Cost-sharing is authorized for:

   a) Diversions, ditches, dikes or subsurface drains. Cost-sharing for subsurface drains is limited to areas on sloping land where the internal water seeps to the surface and causes the land or cover to lose its stability.

   b) Installation of structures such as pipe, underground outlets, or other outlets, if needed, for proper functioning to a ditch or dike, for more even flow, or to protect outlets from erosion.

   c) Necessary leveling and filling to permit installation of an effective system.

   d) Removing obstructions necessary to permit establishment of the practice.

3. Cost-sharing is not authorized for ditches or dikes designed to impound water for later use, or which will be a part of a regular irrigation system.

4. The system must be maintained for a minimum of 15 years following the year of installation.

Specifications: SCS Technical Guide specifications 362, 606, 607, 412

9/79

C4 Terrace Systems Maximum cost-share rate _____

Definition: A system of ridges and channels constructed across the slope on a non-erosive grade at a suitable spacing.

Conditions:

1. Cost-sharing is authorized for:

   a) Terraces and the necessary leveling and filling to permit installation of an effective system.

   b) Removal of obstructions necessary to permit installation of an effective system.

   c) Materials and installation of underground pipe outlets and other mechanical outlets.

   d) Converting the present system to a new system only if the present system is not serving its intended conservation purpose. Cost-sharing will not be authorized if the sole purpose of the conversion is to accommodate changes in cropping patterns or equipment used by the farmer.

2. A protective outlet or waterway is required.

3. The system shall be maintained for a minimum of 20 years following the year of installation.

Specifications: SCS Technical Guide specifications 412, 600 and 606

9/79

C5 Waterways

Maximum cost-share rate _____

Definition: A natural or constructed watercourse shaped, graded and established in suitable cover as needed to prevent erosion by runoff waters.

Conditions:

1. Cost-sharing is authorized for site preparation, grading, shaping, filling, and establishing permanent vegetative cover. Cost-sharing is also authorized for subsurface drains necessary for proper functioning of the waterway.

2. The cover may consist of sod-forming grasses, legumes, mixtures of grasses and legumes or other types of vegetative cover that will provide the needed protection from erosion.

3. Close-sown small grains, annuals or mulching may be used for temporary protection if followed by eligible permanent vegetative cover established by seeding or natural revegetation.

4. The practice shall be maintained for a minimum of 10 years following the year of installation.

Specifications: SCS Technical Guide specifications 342, 412, 484, and 606

9/79

C6 Minimum tillage system (Conservation tillage)

Maximum cost-share rate _____
or flat rate per acre _____

Definition: Tillage practices which disturb and roughen the entire soil surface but not to the extent of mold board tillage systems. Some vegetative residue must remain on the surface.

Conditions:

1. Cost-sharing is based on the custom rate for minimum tillage plowing for a single year.

2. Cost-sharing is not authorized where the farmer has already adopted a satisfactory tillage system.

3. Cost-sharing for this practice will not be approved for a person more than once.

4. The land involved must be protected by crop residue, temporary cover, or other permitted management methods to the extent practical from harvest until the next planting.

5. Eligible tillage operations include:

   a) Chisel plowing with other limited operations,

   b) Plow-plant, or

   c) Light tillage without plowing.

6. On sloping land all tillage operations must be performed as nearly as practicable on the contour or parallel to terraces.

7. The system must be maintained for a minimum of 5 years following the initial year.

Specifications: SCS Technical Guide specification 478.

9/79

M1 Critical Area Stabilization Maximum cost-share rate _____

Definition: Planting suitable vegetation on highly erodable areas (e.g. gulleys, roadsides, construction activities on public lands).

1. Cost-sharing is authorized for:

   a) Permanent fencing to protect the site.

   b) Planting trees, shrubs, perennial grass cover.

   c) For shaping and smoothing prior to the installation of protective structures or plantings.

2. The practice must be maintained for a mimum of 25 years after the year of installation.

Specifications: SCS Technical Guide specifications 342, 472, 484, 512 and 612.

9/79

M2 Grade Stabilization Structures Maximum cost-share rate _____

Definition: A structure used to reduce the grade in a channel in order to protect the channel from erosion or to to prevent the formation or advance of gullies.

Conditions:

1. Cost-sharing is authorized for:

   a) Channel linings, chutes, drop spillways, and pipe drops to discharge excess water.

   b) Fencing and vegetative cover (including mulching needed to protect the structure) and for leveling and filling to permit the installation of the structure.

2. The structure shall be maintained for a minimum of 25 years following the year of installation.

Specifications: SCS Technical Guide specifications 402, 350, 382, 410, 425 and 468.

9/79

M3 Shoreline Protection (Streambank Protection) Maximum cost-share rate _____

Definition: Stabilizing and protecting banks of streams and lakes against erosion.

Conditions:

1. Cost-sharing is authorized:

   a) For permanent fencing to protect banks from damage by domestic livestock.

   b) For planting trees, shrubs, perennial grass cover as filter strips or buffer zones along banks.

   c) To limit livestock access to water.

   d) To install livestock and machinery crossings that will minimize disturbance of the stream channel and banks.

   e) For placement of riprap and other materials on the bank when other practices are not practical.

   f) For shaping and smoothing banks prior to the installation of protective structures or plantings.

2. Livestock must be excluded from the sloped and planted area.

3. The practice shall be maintained for a minimum of 10 years following the calendar year of installation.

Specifications: SCS Technical guide specifications 326, 382, 580 and 342

9/79

M4 Settling Basin Maximum cost-share rate _____

Definition: An impoundment created to retain sediment and other pollutants carried by runoff waters.

Conditions:

1. Cost-sharing is authorized:

   a) For detention or retention structures, such as erosion control dams (excluding water storage type dams), desilting reservoirs, sediment basins, debris basins, or similar structures.

   b) For channel linings, chutes, drop spillways, and pipe drops that dispose of excess water.

   c) For fencing and vegetative cover (including mulching needed to protect the structure) and for leveling and filling to permit the installation of the structure.

2. Cost-sharing is not authorized for structures with a primary purpose of flood control or creation of a permanent pool.

3. The structure must be maintained for a minimum of 25 years following the year of installation.

Specifications: SCS Technical Guide specifications 402, 350, 382, 410, 425 and 468

9/79

L1 Barnyard Runoff Management Maximum cost-share rate _____

Definition: Using structural practices such as gutters, downspouts and diversions to intercept and redirect surface runoff around the barnyard, feeding area or farmstead, and/or to collect, convey and temporarily store runoff from the barnyard, feeding area or farmstead.

Conditions:

1. Cost-sharing is authorized for:

   a) Diversions, gutters, downspouts, collection basins, infiltration areas, waterway outlet structures, piping and land shaping needed to manage runoff from areas where livestock manure accumulates.

   b) Measures needed for the establishment of perennial grasses, including fertilizers and other minerals.

   c) Permanent fencing.

2. The practice must be maintained for a minimum of 15 years following the year of installation.

Specifications: SCS Technical Guide specifications 312, 342, 362, 382, 412, 425 and 606.

9/79

L2 Manure Storage Facilities Maximum cost-share rate _____

Definition: A structure for temporary storage of manure.

Conditions:

1. Cost-sharing is authorized for:

   a. Aerobic or anaerobic lagoons, liquid manure tanks and solid manure stacking facilities and equipment necessary for transporting manure to the storage facility required as part of a manure management plan.

2. Cost-sharing is not authorized for:

   a. Operations where manure can be spread on location which are nearly flat land or which do not drain to surface waters.

   b. Portable pumps and other portable equipment;

   c. Buildings or modifications to buildings;

   d. Equipment for spreading or incorporating manure; and

   e. That portion of the facility installed under or attached to buildings serving as part of the building or its foundation.

3. Storage facility must have a minimum of 180-day storage capacity.

4. Runoff from solid manure stacking facilities must be controlled.

5. Manure must not be spread when the ground is frozen or saturated.

6. Manure must be incorporated into the soil as soon as practicable after spreading.

7. Lagoons must be constructed to assure sealing of the bottom and sides in order to prevent contamination of wells and groundwater.

8. The practice must be maintained for a minimum of 20 years following the year of installation.

Specifications: SCS Technical Guide specifications 313, 425 and 359

9/79

L3 Livestock Exclusion from Woodlots* Maximum cost-share rate _____

Definition: Protection of woodlots from livestock grazing by fencing or other means.

Conditions:

1. Cost-sharing is authorized for permanent fencing.
2. Livestock must be excluded from the woodlot.
3. The practice must be maintained for a minimum of 20 years following the year of installation.

Specifications: SCS Technical Guide specifications 382, 472.

* Livestock exclusion from streambanks is included as part of shoreline protection.

9/79

U1 Leaf collection Maximum cost-share rate _____

Definition: Collection or management of leaves, seeds, grass clippings and other vegetative matter in order to prevent accumulation in gutters and leaching of nutrients.

Conditions:

1. Cost-sharing is authorized for equipment (or prorated portion of time that equipment is used) or manpower required to increase the frequency and/or efficiency of vegetative matter collection for a one-year period.

2. Cost-sharing for this practice will not be approved for a municipality more than once.

3. The practice must be maintained for a minimum of 5 years after the initial year.

9/79

U2 Street sweeping Maximum cost-share rate _____

Definition: Mechanical street sweeping to remove vegetative matter, debris and particulates from gutters.

Conditions:

1. Cost-sharing is authorized for equipment (or prorated portion of time that equipment is used) and manpower required to increase street sweeping efficiency or frequency to more than once every two weeks during the period of April 1 to November 1 for a one-year period.

2. Cost-sharing for this practice will not be approved for a municipality more than once.

3. The practice must be maintained for a minimum of 5 years after the initial year.

9/79

U3 Infiltration systems Maximum cost-share rate _____

Definition: Structures such as dutch drains, porous pavement, lattice blocks and dry wells which increase infiltration and reduce runoff from impervious surfaces.

Conditions:

1. Cost-sharing is authorized for:

   a) excavation, grading and shaping;

   b) construction materials and

   c) installation of materials

2. Cost-sharing is not authorized for the portion of the total costs normally associated with conventional systems (i.e. costs associated with conventional paving of parking lots or roadways is not considered as an eligible cost).

3. The practice must be maintained for a minimum of 10 years after the year of installation.

9/79

V. Substitute Practices

The Wisconsin Nonpoint Source Water Pollution Abatement Program allows for substitute management practices. Substitute management practices are simply innovative or rarely used - yet effective and practicable management practices-not identified as best management practices in areawide water quality management plans. They may be eligible for cost-sharing.

Substitute management practices must be reviewed and approved by the designated management agency and the Board of Soil and Water Conservation Districts. The Department of Natural Resources will identify whether the practice is eligible for cost-sharing and assign a maximum cost-sharing rate.

SCS Technical Guide standards and specifications will be used where available. If standards and specifications are not available, the SCS Technical Guide work group will review the request and recommend design criteria.

VI. Best Management Practices not Eligible for Cost-sharing

The following best management practices are not eligible for cost-sharing. All are very effective practices. However, they are either low-cost, no-cost or high benefit to the land user. Their use should be encouraged.

Cultural Management - Proper timing, location, and intensity of cropping operations from seedbed preparation to harvest to reduce nonpoint source pollution while achieving optimum production. Spring plowing as opposed to fall plowing is an example of a type of cultural management prevalent in Wisconsin.

Facility Location - An alternative pollution control measure for barnyards, feedlots, and supporting activities is properly locating the facility.

Fertilizer and Irrigation Water Management - The correct application of fertilizers to reduce their potential as a pollutant. This will involve the proper timing and placement of fertilizer applications and using the proper type and quantities for the crops being grown. While excessive fertilizer applications can be detrimental to water quality, soils low in fertility are often more subject to erosion because of reduced ground cover. Fertilizer management is most critical in irrigated areas where proper coordination of fertilizer application with irrigation activities is essential.

Livestock Management - To prevent damages from overgrazing. This can involve rotational grazing, measures to promote uniform grazing, and delayed or deferred grazing to allow plant growth. Livestock management is also applicable in barnyards and feedlots for animal waste control.

Pesticide Management - The proper timing, placement, and quantities of pesticides to prevent degradation of water quality. Also included are proper container disposal and proper clean-up methods.

Waste Disposal Management - The proper timing, rate, and location of animal waste disposal to prevent discharge of organic wastes and nutrients into receiving waters. Wastes would include manure and collected barnyard runoff.

Winter Cover Crop - A crop of close-growing grasses, legumes, or small grain used to control erosion during periods when the major crops do not furnish adequate cover. In Wisconsin these crops are applicable on sloping land where corn is removed for silage, soybeans harvested, and in orchards. Cover crops are also used following removal of tobacco, potatoes, and canning crops.

Crop Residue Use - Using plant residues to protect the soil during critical erosion periods. This involves leaving plant residues on the surface after harvesting and incorporation into the soil just prior to planting operations. The protection afforded the soil varies with the amount of residues produced and amount remaining on the surface after tillage. Crop residues also conserve moisture and increase infiltration. Crop residues can be a source of organic wastes if subjected to excessive runoff and utlimate discharge into receiving waters. Decay of plant residue makes soluble phosphorus available to runoff.

Crop Rotation - Growing different crops in a regular sequence as part of a planned cropping system to reduce erosion. Crop rotation is routinely used by many landowners in Wisconsin and serves as an example of a management practice that is beneficial to the farmer and reduces pollutant discharge.

Pasture and Hayland Planting - Establishing and reestablishing long-term stands of adapted species of perennial or reseeding forage plants.

SIXMILE PHEASANT BRANCH WATERSHED RURAL SUMMARY

			ACRES BY SUBWATERSHED									
			SFPB	NFPB	MPB	LPB	AWM	BWM	SM	SC	LMD	TOTALS
Continuous Corn	U&D	B Slope										
Continuous Corn	U&D	C Slope	240	140		140	100	120		240	20	1,000
Continuous Corn	Contour	C Slope	20	47		20	60	180	200	480		1,007
Continuous Corn	U&D	D Slope		13						60		73
Continuous Corn	Contour	D Slope		10				120				130
Rotation	U&D	C Slope	20	860		120	1,210					2,210
Rotation	Contour	C Slope	40	200		20	420	200	20		40	940
Rotation	U&D	D Slope		60			120					180
Rotation	Contour	D Slope					60					60
Short Rotation	U&D	C Slope					20			240		260
Short Rotation	Contour	C Slope							30	360		390
Short Rotation	U&D	D Slope								20		20
Contour Strips		C Slope	60	220		20	120					420
Contour Strips		D Slope		20			90					110
Woods		D Slope	20	80			150		20	20		290
Woods		E Slope					60					60
		within 1/8 MI	340	180		280	260	120		960	80	2,220
Grassland		C Slope	20							20		40
Grassland		E Slope					20					20
Pasture		C Slope					20		10			30
"		D&E Slope	20	10					20			50
TOTALS			780	1,840	0	600	2,710	740	300	2,400	140	9,510

APPENDIX B

TABLE C-1

WILLOW CREEK WATERSHED*

LAND USE CATEGORY	AREA (Acres)	PERCENT OF TOTAL	ROOFTOP AREA x 0.5 (Acres)	DIRECTLY CONNECTED PAVED AREA (Acres)	DIRECTLY CONNECTED IMPERVIOUS (Acres)	DIRECTLY CONNECTED IMPERVIOUS (Percent)
Single Family	1,178.46	59.47	91.55	198.25	289.80	
Multi-Family	144.17	7.28	18.18	31.59	49.77	
Institutional	164.15	8.28	13.23	59.43	72.66	
Commercial	146.47	7.39	24.14	75.23	99.37	
Manufacturing	4.13	0.21	3.30	0.54	3.84	
Park/Open Space	249.23	12.58	0.30	7.11	7.41	
Vacant/Developing	6.90	0.35	0.00	1.03	1.03	
Agriculture	88.15	4.44	0.00	4.01	4.01	
TOTAL	1,981.66	100.00	150.70	377.19	527.89	26.64

*Several small non-contributing areas excluded.

TABLE C-2

SPRING HARBOR WATERSHED

LAND USE CATEGORY	AREA (Acres)	PERCENT OF TOTAL	ROOFTOP AREA x 0.3 (Acres)	DIRECTLY CONNECTED PAVED AREA (Acres)	DIRECTLY CONNECTED IMPERVIOUS (Acres)	DIRECTLY CONNECTED IMPERVIOUS (Percent)
Single Family	663.44	31.46	22.31	94.55	116.86	
Multi-Family	104.47	4.95	5.43	20.89	26.32	
Institutional	130.16	6.17	5.79	20.19	25.98	
Commercial	320.69	15.21	12.44	111.38	123.82	
Manufacturing	5.97	0.28	1.79	1.33	3.12	
Park/Open Space	333.86	15.83	0.33	28.06	28.39	
Vacant/Developing	107.66	5.11	0.91	8.13	9.04	
Agriculture	442.54	20.99	0.00	27.50	27.50	
TOTAL	2,108.79	100.00	49.00	312.03	361.03	17.12

TABLE C-3

PHEASANT BRANCH CREEK WATERSHED - URBAN SERVICE AREA PORTION*

LAND USE CATEGORY	AREA (Acres)	PERCENT OF TOTAL	ROOFTOP AREA x 0.3 (Acres)	DIRECTLY CONNECTED PAVED AREA (Acres)	DIRECTLY CONNECTED IMPERVIOUS (Acres)	DIRECTLY CONNECTED IMPERVIOUS (Percent)
Single Family	768.27	17.07	24.13	129.54	153.67	
Multi-Family	156.98	3.49	12.05	32.50	44.55	
Institutional	63.50	1.41	3.29	16.58	19.87	
Commercial	165.74	3.68	3.99	48.38	52.37	
Manufacturing	131.07	2.91	5.05	27.74	32.79	
Park/Open Space	331.03	7.35	0.07	9.72	9.79	
Vacant/Developing	308.12	6.85	1.11	32.31	33.42	
Agriculture	2,134.28	47.43	0.00	34.19	34.19	
Wetland	441.29	9.81	0.00	0.00	0.00	
TOTAL	4,500.28	100.00	49.69	330.96	380.65	8.46

*Includes Tiedeman's-Stricker's Pond drainage area, but excludes Esser's Pond drainage area (206 acres).

TABLE C-4

DIRECT LAKE DRAINAGE - URBAN SERVICE AREA

LAND USE CATEGORY	AREA (Acres)	PERCENT OF TOTAL	ROOFTOP AREA x 0.3 (Acres)	DIRECTLY CONNECTED PAVED AREA (Acres)	DIRECTLY CONNECTED IMPERVIOUS (Acres)	DIRECTLY CONNECTED IMPERVIOUS (Percent)
Single Family	1,101.91	53.68	22.75	145.37	168.12	
Multi-Family	142.03	6.92	7.11	44.99	52.10	
Commercial/ Institutional	107.13	5.22	3.85	53.05	56.90	
Manufacturing	1.15	0.06	0.26	0.50	0.76	
Park/Open Space	421.60	20.53	0.00	20.87	20.87	
Vacant/Developing	40.03	1.95	2.03	9.96	11.99	
Agriculture	231.02	11.25	0.00	5.76	5.76	
Wetland	8.03	0.39	0.00	0.00	0.00	
TOTAL	2,052.91	100.00	36.00	280.50	316.50	15.42