Clean Water PLAN

1998

METRO VISION 2020

Denver Regional Council of Governments

METRO VISION 2020

CLEAN WATER PLAN

Policies, Assessments and Management Programs

June 17, 1998

Denver Regional Council of Governments
2480 W. 26th Avenue, Suite 200B
Denver, Colorado 80211-5580

Pursuant to Sections 30-28-105 through 30-28-110 and 25-8-105, C.R.S., the Denver Regional Council of Governments (DRCOG) adopted by Resolution No. 10 (June 17, 1998), this Clean Water Plan for the area described in the plan. The plan is part of DRCOG's regional master plan for the Denver region. The plan, as so adopted, supersedes any water quality management plan for said area previously adopted by DRCOG.

By:_____ _____

Chairman Date

Denver Regional Council of Governments

By: _____ _____

Secretary-Treasurer Date

Denver Regional Council of Governments

ABSTRACT

TITLE	Metro Vision 2020 *Clean Water Plan* Policies, Assessments and Management Programs
AUTHOR	Denver Regional Council of Governments (DRCOG)
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ABSTRACT	The *Clean Water Plan* describes wastewater management strategies, watershed water quality programs, wasteload allocations, stream standards, priority regional projects, nonpoint source control strategies and stormwater management programs. The plan provides a regional context for protecting and maintaining water quality through integrated watershed management processes. The objectives, policies and guidelines used in water quality planning and wastewater management are described in the plan. This update reflects modifications to water quality planning and wastewater management resulting from changes in local and regional urbanization plans. The plan is an integrated part of the Metro Vision 2020 Plan.

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Clean Water Plan role

The Denver Regional Council of Governments (DRCOG) is responsible under state and federal statutes for regional water quality planning in the Denver area. In this capacity, the council prepares and updates the *Clean Water Plan*, (CWP) the management plan for achieving water quality standards pursuant to section 208 of the federal Clean Water Act. The *Clean Water Plan* describes wastewater management strategies, watershed water quality programs, nonpoint source control strategies, stormwater management programs, wasteload allocations, stream standards and priority regional projects. It also contains planning data for up to a 50-year horizon on wastewater treatment facilities. The *Clean Water Plan* provides a regional context for protecting and maintaining water quality through integrated watershed management processes.

The 25-year process defined through the *Clean Water Plan* is to draw upon existing and projected water quality assessments at the watershed level to identify priority point, nonpoint and stormwater quality problems. The plan recommends appropriate measures and solutions, including the necessary system of treatment works or facilities, management agencies, financial, institutional measures and management strategies, necessary for implementation of recommended solutions consistent with the objectives and goals of the federal Clean Water Act, Colorado Water Quality Act and regional watershed programs.

The management planning process is designed to recommend state water quality standards, address water quality and related environmental issues associated with regional growth and recommend implementation strategies to restore impaired water resources. The planning process is continuous and iterative. As solutions are found to many of the more pressing pollution problems, other issues and problems need solutions. The objectives, policies and guidelines used in water quality planning and wastewater management as described in the *Clean Water Plan* are designed to steer this process.

Clean Water Plan goal and objectives

The goal for the region is *to restore and maintain the chemical and physical integrity in order to assure a balanced ecological community in waters associated with the region*. Stakeholders within the region have a variety of interpretations on the meaning of *restoring and maintaining the chemical and physical integrity, and a balanced ecological community*. As a result, fully meeting the regional goal to the satisfaction of all stakeholders is probably not achievable by the planning horizon of 2020. However,

the quality of the region's water bodies and surrounding land uses will be preserved and enhanced through the implementation of strategies recommended in the *Clean Water Plan*.

Even as treatment facilities have improved, water quality goals have become more difficult and costly to meet. The physical, biological and ecological characterization of the region's water resources has just begun, and substantial efforts will be needed to resolve problems and find workable solutions. Since the council has authority under state and federal statutes to maintain a bottom-up planning process, five key objectives were adopted as part of the *Metro Vision 2020 Plan* to support a proactive bottom-up planning process with regional coordination:

1. A locally defined *balanced ecological community* will be achieved through implementation of water quality protection and appropriate water resource management initiatives, provided that a balance will be maintained between the natural environment and those designated uses of the resource.

2. The chemical and physical integrity of the region's aquatic environments will be restored and maintained through a coordinated watershed management process.

3. Effective wastewater treatment will be identified through a regional process, with local implementation of wastewater management strategies.

4. Effective and balanced stormwater and nonpoint source management can best be achieved through local implementation processes.

5. Effective and cost-efficient water quality management and supply will require an integrated resource management program.

Metro Vision 2020 Plan integration

The *Clean Water Plan* is an integrated part of the *Metro Vision 2020 Plan,* which was adopted by the Board of Directors in March 1997. While the *Clean Water Plan* provides strategies and policy direction to preserve and enhance the region's water resources and aquatic environment, the primary link to the *Metro Vision 2020 Plan* is through the wastewater utility plans. This is especially true in light of the role of the *Clean Water Plan* in the state and federal wastewater permitting decision processes. The Metro Vision linkages allow the *Clean Water Plan* to remain flexible, collaborative and effective, while incorporating mechanisms to assist local governments in voluntarily meeting water resources goals.

State and federal context

Water quality management is a regulatory program governed by the federal Clean Water Act and state statute. However, DRCOG's role, as defined in both state and federal law, is not regulatory but planning. As the designated planning agency,

DRCOG's approved *Clean Water Plan* provides the guidance to regulatory agencies in making water quality decisions. Based on federal law, no facility permit should be issued which is inconsistent with the approved regional plan.

The role of DRCOG as an areawide planning agency in water quality management is defined in the federal Clean Water Act, along with the definition of water quality management plans. Water quality management consists of initial plans produced in accordance with the federal Clean Water Act (sections 208 and 303(e)) and certified and approved updates to those plans. Continuing water quality planning is based upon water quality management plans and water quality problems identified in the state water quality inventory reports (section 305(b)).

The relationship between the planning agencies, approved plans and regulatory agencies is defined in the *Continuing Planning Process for Water Quality Management in Colorado* as maintained by the Colorado Water Quality Control Commission. It sets forth objectives and operational requirements of the state's water quality management program, its organizational structure, intergovernmental decision making process, and timing relationships. This process acknowledges the regulated community's role in making water quality management an effective and efficient process through an iterative program. The *Clean Water Plan* reflects the regulated community's preference for a wastewater management system and, as a water quality management plan, it is used to direct implementation.

For the water quality management plans (e.g., *Clean Water Plan*) to remain as useful decision making documents, it is necessary that specific components of these plans must be amended periodically. Amendments to the plans must be made in accordance with the federal Clean Water Act and Colorado Water Quality Act. The principal management plan elements that need to be kept current by designated planning agencies through the update and amendment process are defined in the state continuing planning process.

As part of the State Water Quality Act, site applications are needed for construction or expansion of wastewater treatment works, lift stations, and major interceptor lines. Final action on site applications is a function of the Water Quality Control Division after a review by appropriate local entities and DRCOG. The discharge permit represents the basic tool for achieving water quality goals. It is a legally enforceable document, which can subject a violator to significant penalties.

One function of the *Clean Water Plan* is to determine where water quality limitations are needed and to recommend appropriate limits. This is especially critical in complex urban watersheds where effluent of many facilities intermingles. In accordance with the site application review process and other regulatory review processes, DRCOG reviews all proposed water quality and wastewater management projects within the DRCOG planning region.

Management responsibilities and processes

The planning responsibilities of DRCOG are defined in the *Clean Water Plan*. These responsibilities are designed to assure that the necessary information for water quality decisions is adequate and up-to-date and that there is proper follow-through on the part of DRCOG consistent with the requirements of the continuing planning process. DRCOG is responsible for reviewing the status of water quality in the 11 designated watersheds and reporting on progress in meeting the local, state, and federal water quality goals established in approved plans. The *Clean Water Plan* serves as the required water resources management progress report.

The plan maintains information on a broad spectrum of topics that are defined as DRCOG planning responsibilities. These topics include, but are not limited to, population and land use forecasts, wastewater flows, system of facilities, treatment facility characterization, wasteload allocations, nonpoint source and urban stormwater management and control, residual waste, land disposal, water quality characterization, stream modeling, management plans, construction scheduling, funding priorities, and other appropriate wastewater and water quality planning information.

The relationship between DRCOG and designated management and associated operating agencies is defined in the *Clean Water Plan*. Management agencies may be individual municipal governments, watershed associations and authorities or general-purpose governments holding a Colorado wastewater discharge permit or other special districts responsible for planning and approval of permitted facilities. Local governments or affiliated agencies can enter into agreements in order to form watershed associations or authorities with a single management agency designation.

The *Clean Water Plan* currently recognizes five watershed associations as management agencies (Adams County Water Quality Association, Bear Creek Watershed Association, Chatfield Watershed Authority, Cherry Basin Authority and Upper Clear Creek Watershed Association), eight counties (Adams, Arapahoe, Boulder, Clear Creek, Denver, Douglas, Gilpin and Jefferson), one special district (Metropolitan Wastewater Reclamation District), and 20 general-purpose governments. Chapter VI summarizes the major management agencies within each of the 11 watersheds.

The authorities of management agencies designated by the Governor to implement the *Clean Water Plan* are contained in the plan. Management agencies are encouraged to work closely with DRCOG on water quality and water resources issues. Operating, collector and interceptor agencies must work through the designated management agency to which they are tributary. Management agencies are expected to carry out appropriate portions of the *Clean Water Plan*, while effectively managing, designing, constructing and operating wastewater treatment works and related facilities for a designated service area.

Management agencies can raise revenues, and accept and use grants, loans and funds from other sources for wastewater treatment management purposes. Management agencies are responsible for assuring implementation of an approved wastewater treatment management plan, with each participating community paying its proportionate share of treatment costs.

Periodically, performances of management agencies will be reviewed to determine if they have been effective in implementing the *Clean Water Plan*. In rare cases, it may be necessary to recommend changes to the structure of management agencies based on new information, recommendations of the watershed association, or on results of watershed water quality studies. The traditional, clearly defined role of local health departments in the maintenance of safe water will continue. The watershed protection approach advocated by the *Clean Water Plan* begins at the local level in what is termed as a *bottom-up* process. This bottom-up process assures local decisions and management strategies will be incorporated in regional plans and recognized in state water resources decision making processes.

DRCOG uses the Water Resources Management Advisory Committee (WRMAC) as an advisory body on matters concerning water resources, including but not necessarily limited to, wastewater collection, treatment and disposal, nonpoint source pollution control, reuse of wastewater, water supply, water quality, urban drainage and management of water pollution. The committee membership includes representatives from management agencies, general-purpose governments and selected industries who help the council of governments maintain and update the regional *Clean Water Plan*. The committee serves as a regional advisory group for watershed total maximum daily load allocation programs.

Wastewater management

The regional planning process takes a broad perspective related to facility needs, scheduling, treatment levels, and setting priorities for needed facilities. Management agencies and associated operating agencies, in addition to being responsible for implementing aspects of the *Clean Water Plan*, decide on the need for and specific characteristics of wastewater treatment processes and the details of implementation within specified parameters.

The *Clean Water Plan* identifies five factors for determining consistency of permit and site applications: location, sizing, staging, service area and effluent quality. Three of these (sizing, staging and service area) are growth related. DRCOG has used forecasts from its regional development plan to calculate sizing and staging needs of treatment facilities and uses the extent of expected urban development to refine locally defined service areas.

In determining the wastewater treatment needs, the primary goal is to provide reasonable, feasible and economical wastewater service to any particular area.

Consideration is given to the impact the treatment system will have on receiving waters, the ability to meet water quality standards and the impact a discharge may have on downstream dischargers. The need for a treatment system is based on growth and development, which has been approved by local governments and is consistent with DRCOG's *Metro Vision 2020 Plan*.

System of treatment works

Currently, the DRCOG region is served by 110 permitted domestic wastewater treatment facilities, which range in size from one large 185-million gallon-per-day (MGD) system to 55 small facilities that are sized less than 0.5 MGD. About 6 percent of the population in the region does not receive centralized sewer service and uses individual sewage disposal systems. On a regional basis, these individual systems generate about 13.2 MGD of discharge into groundwater aquifers.

The region treats about 230 million gallons per day of wastewater through centralized systems. The combined design capacity of existing wastewater treatment systems is about 321 MGD. Based on 2020 growth expectations, the region will still need to add at least 20 MGD of additional municipal wastewater treatment capacity. Chapter VI of the *Clean Water Plan* contains a summary of the system of treatment works for each of the 11 watersheds in the region. Detailed information about these treatment works is contained in technical appendices to this plan.

Facility sizing

Major wastewater treatment facilities include those permitted systems which are expected to expand within a 20-year planning horizon and require additional planning information be generated on a timely basis. Minor wastewater treatment plants have design capacities of 50,000 gallons per day or less and they are expected to function without any increase in the permitted design capacity within the planning horizon. Wastewater utility service areas for major treatment works are defined as serving over 200 residential equivalents with a permitted wastewater treatment facility design capacity larger than 50,000 gallons per day or the facility does not qualify as a minor treatment facility.

Service areas

Each wastewater treatment facility has a designated treatment facility site and a defined service area. The service area is that area to which the facility provides wastewater service or will provide service in the future. The service area is usually defined by urbanized areas requiring services by the year 2020 and may be defined by municipal boundaries, legal boundaries of sanitation districts or hydrologic boundaries. The boundaries should be consistent with the adopted extent of urban development in the *Metro Vision 2020 Plan.*

Recognizing that it is easier to forecast levels of expected regional growth than it is to identify location where short-term growth will occur, the *Clean Water Plan* will recognize two types of service areas: *wastewater utility service areas* that are consistent with the Metro Vision 2020 urban growth boundaries; and *CWP planning areas* either equal to utility service areas or larger. Wastewater treatment facilities and appropriate management agencies will have consistent *CWP planning area* designations mapped and maintained through the *Clean Water Plan*. Overlapping *wastewater utility service areas* or *CWP planning areas* will *not* be recognized in the plan. Local resolution of overlap issues is necessary before there is regional recognition.

The shape or contiguity of major *wastewater utility service areas* (e.g. urban growth area for 2020) is a function of *Metro Vision 2020 Plan.* It is not a function of the *Clean Water Plan* to define the outer boundaries consistent with the extent of urban development. The *CWP planning area* maps, as included in technical appendices to the *Clean Water Plan*, will be used by DRCOG in the site application review process. New transmission or treatment facilities designed to fully serve development outside *utility service areas* will not be recommended.

Wastewater utility plans

The primary goal in establishing wastewater utility plans is to provide reasonable, feasible and economical wastewater service to an area designated for urban development or within the DRCOG watersheds. Utility plans should consider the water quality impact the treatment system will have on receiving waters and provide a strategy for meeting all applicable water quality standards and classifications, while quantifying the potential impact a discharger may have on other dischargers. Detailed utility plans are encouraged for each planning area. Utility plans will document the wastewater management strategy for a wastewater treatment facility (greater than 2000-gallons-per-day capacity) and the associated utility service area and planning area.

It is assumed that utility plans meeting minimum recommendations contained in the *Clean Water Plan* will be available for *wastewater utility service areas* and associated planning areas with a target of January 1, 2003 for completion of all utility plans. Beginning January 1, 1999, *Clean Water Plan* amendments, site application approvals and other approvals under the *Clean Water Plan* will necessitate a recognized wastewater utility plan. It is assumed that utility service area forecasts will be maintained consistent with all Metro Vision 2020 forecasts. The council will maintain a reference set of accepted utility plans developed by management agencies or operating agencies for all permitted wastewater treatment facilities with an active discharge permit.

On an annual basis, the WRMAC will request confirmation of the utility plans from the regional council's Board of Directors on recommendations through the *Metro Vision 2020 Plan* assessment process. Recognized and conditionally recognized utility plans

will be referenced in the *Clean Water Plan* and these plans will represent the preferred wastewater management strategy for the wastewater utility service area and the CWP planning area. Recognized and conditionally recognized utility plans will be used in the site application review process as *Clean Water Plan* amendments and to meet other appropriate regulatory requirements. Utility plans may be forwarded at any time to the WRMAC for review and recommendation. The *Clean Water Plan* includes the minimum recommended components of wastewater utility plans.

Biosolids

The *Clean Water Plan* estimates more than 115 wastewater treatment facilities will be operational by 2015 in the eight-county DRCOG region. Over the past 20 years, these wastewater-operating agencies have been helping to improve the water quality by producing ever-cleaner effluent prior to discharge. One result of this increasingly cleaner effluent is more solids are being removed from the wastewater flow during the treatment process. This mostly-organic residual solid material, when treated in compliance with strict Colorado and federal regulations, becomes a valuable, recyclable, nutrient-rich resource called *biosolids*. DRCOG recognizes and supports the economic and environmental benefits of recycling biosolids, and appropriate Council policy documents will recognize the value of biosolids recycling.

Alternative treatment

The wastewater service for mountainous portions of the region can be achieved by one or a combination of three primary treatment schemes: 1) onsite individual wastewater treatment using a septic tank and drainage field system or alternate technology; 2) cluster wastewater treatment systems which connect multiple households to a small treatment system using conventional or alternative technologies; and 3) centralized wastewater treatment facility to service the entire development community. A non-centralized wastewater treatment facility comprised of treatment and disposal alternatives, which serve individual, or clusters of, residences can be a less costly alternative to the conventional central facility in a non-urban setting.

Properly designed and constructed small alternative wastewater treatment systems can process sewage in a cost-effective, efficient and non-polluting manner. A well-engineered and maintained septic or individual disposal system can be protective of groundwater quality criteria, while not contributing to surface water degradation. However, poorly designed or failed systems frequently contribute to nonpoint source pollution in planning watersheds. Septic or individual disposal systems designed for flows over 2,000 gallons per day require approval from the appropriate management agency. Systems over 2,000 gallons per day are regulated as wastewater treatment works as defined in the state site application process. These regulated systems are recognized in the *Clean Water Plan.*

Water quality protection

Watershed planning

Maintenance, improvement and restoration of regional water resources in the Denver metropolitan region is an issue of great concern to local governments, special districts, state agencies and federal agencies. The *Clean Water Plan* outlines the institutional responsibilities among these various entities in the water quality management system. DRCOG has approached regional water quality planning and management through regionally linked programs using local management agencies. These must fit within a federal regulatory system primarily administered through the Colorado Water Quality Control Division.

Certain planning functions and water resources issues require a policy statement or recommended guidance to provide a common, consistent basis for decision making. Roles, functions and regulations are continually changing which requires that the *Clean Water Plan* respond to new directions in water quality planning. The plan should not be viewed as a static, all-encompassing statement but rather, a flexible document, which provides policy direction and summarizes special studies. The plan provides accepted planning policies, planning principles and recommended guidance for water quality management and implementation.

The goal of the *Clean Water Plan* is to develop strategies and implementation plans, which will result in achieving all beneficial uses within all waters of the region. Over the last few years interest has increased in Colorado and across the nation in a more holistic, integrated approach to environmental and natural resource management. Efforts to take into account the importance of ecological integrity or to consider the development of biological criteria are examples of this trend. These efforts are most logically rooted in a determination of the overall water quality uses and values to be protected or achieved in a particular watershed.

The 11 watersheds used in the *Clean Water Plan* are shown in Figure 1. These watershed boundaries do not define the DRCOG planning area, which is limited to the eight-county metropolitan region. A number of political and management issues will need resolution before an integrated, holistic watershed protection approach can be implemented beyond the DRCOG planning region.

The council will proactively seek to systematically incorporate into the *Clean Water Plan* a characterization of water quality trends for stream segments in all designated DRCOG watersheds. Trend characterizations will be submitted to the Water Quality Control Division of the Colorado Department of Public Health and Environment (CDPHE) for use in the state water quality characterization report and the list of critical stream segments.

Standards and classifications

The Water Quality Control Division of the CDPHE has a responsibility to assess whether there is a need for additional water quality data to make recommendations on standard changes to the Water Quality Control Commission. In most cases, the availability of the database is a function of the number and types of discharges to the specific stream, or the importance placed on the stream by individuals, municipalities or industries. The final classifications and standards are incorporated into the *Clean Water Plan* and used as the basis for local recommendations in any planning related decisions. Additionally, the *Clean Water Plan* is used as one method to recommend changes to standards and classifications based on local or regional data evaluations and local or regional preferences for beneficial uses.

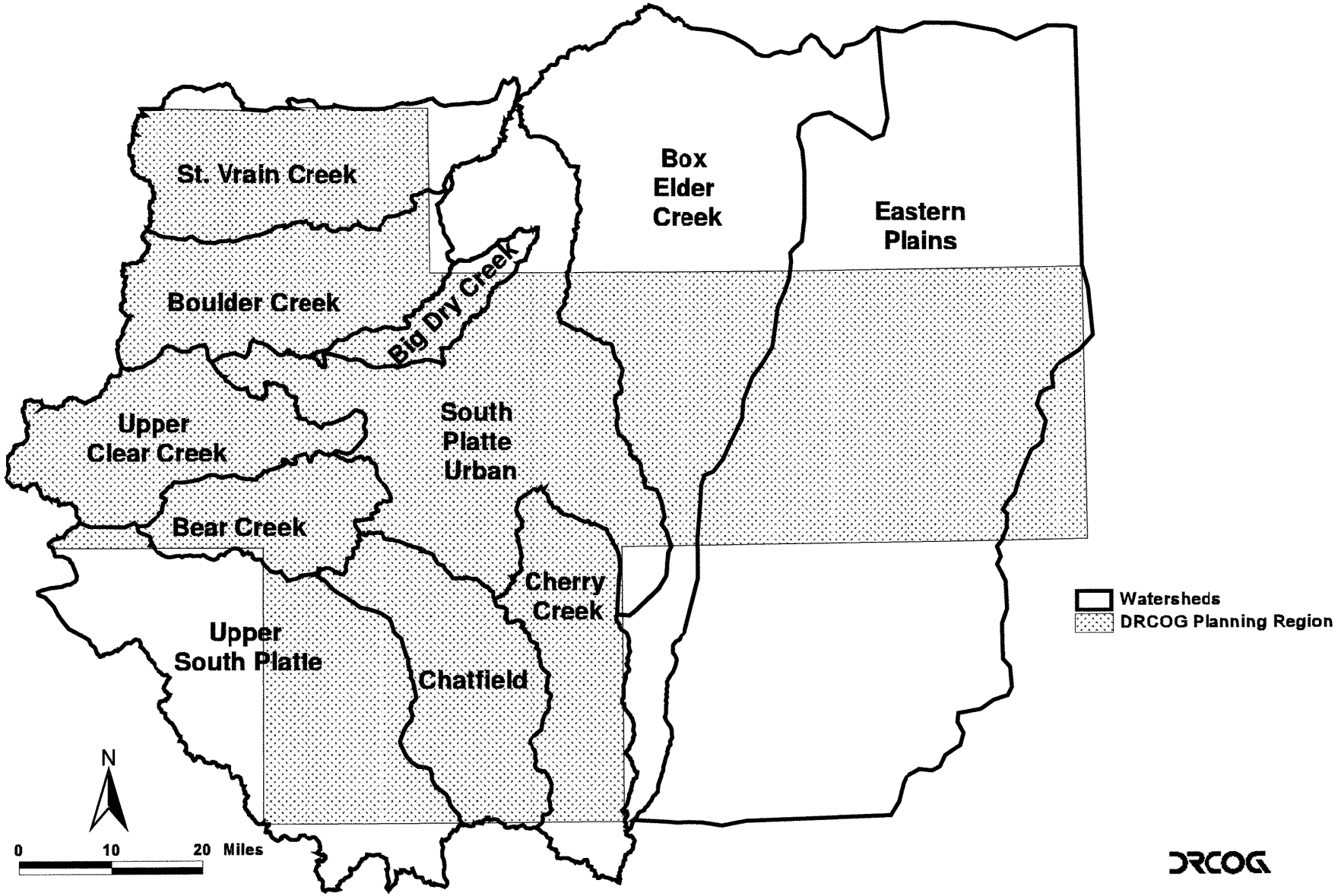
Recommendations for standard or classification changes will be forwarded to the WRMAC for consideration only after they are supported by the appropriate management agency, watershed association or other vested stakeholders. The advisory committee can fully accept, conditionally accept or return these recommendations to the appropriate stakeholder group for further consideration. The advisory committee will submit fully accepted and conditionally accepted standard or classification recommendations to the DRCOG Board of Directors through the *Metro Vision Plan* assessment process or by special action when necessary. Recommended changes will be submitted to the Water Quality Control Division for review and the Water Quality Control Commission for action after Board acceptance of the recommendations.

The second process for changing standards allows a party to request a separate rulemaking hearing before the Water Quality Control Commission. When a rulemaking hearing is scheduled, the party requesting the hearing is asked to submit available information to DRCOG for the agency's consideration and recommendation prior to the scheduled hearing. In reviewing the request, the council will consider the appropriateness and basis of the request based on a review by the Water Resources Management Advisory Committee.

Water quality monitoring

Local governments have identified a significant problem related to the availability and acceptability of water quality data. Dependent on which data sets are used and how trend data is interpreted, a different water quality assessment can emerge. A better water quality characterization of trends needs to be systematically developed for stream segments in the DRCOG region using methodology acceptable to the Water Quality Control Division. Local management agencies are willing to spend funds on water quality data collection if this data is used in the state water quality characterization report (305(b)) and subsequent stream segment impairment listing (303(d)).

Figure 1
Clean Water Plan Watersheds



Total maximum daily load allocations

The federal Clean Water Act requires all watersheds which have significant point and nonpoint source discharges and associated water quality problems to use a *total maximum daily load* (TMDL) process in establishing load limits. A TMDL process is a mechanism to allocate pollutant loads or potential pollutant loads among all identified sources in a manner so that the combined discharges do not cause the water quality standards for a given water body to be exceeded under existing and future conditions. Generally, in the DRCOG region, load limits developed through a TMDL process have resulted in point source permit limits. Permits issued under the National Permit Discharge Elimination System (NPDES) are administered by the CDPHE through the Water Quality Control Division. Ideally this process makes TMDLs a tool for attaining state water quality standards, integrating point and nonpoint loads, setting priorities and targets, and facilitating cost-effective solutions among the regulated community.

The state's list of impaired waters is used to determine which stream segments require total maximum daily load allocations for water quality parameters of concern. As a result of current state listings, wasteload allocation efforts in the 11 DRCOG designated watersheds will be in progress over the next 10 to 15 years with local and regional recommendations developed on load allocations for all parameters of concern. Recommendations could include changes to standards and classifications.

Management strategies

Watershed water quality assessments and wastewater management strategies are available for the 11 DRCOG designated watersheds. Total maximum daily load allocation studies have been completed or are in progress for seven of the watersheds. Total maximum daily load allocation studies are not required at this time for the plains watersheds. Management agency types vary from one watershed to another with watershed associations, watershed authorities, general-purpose governments and special districts functioning as management agencies. The *Clean Water Plan* summarizes the system of wastewater treatment facilities within each watershed and identifies general wastewater management strategies.

A number of local and regional watershed management and protection efforts have already been initiated in the DRCOG region: Bear Creek Watershed, Upper Clear Creek Watershed, Cherry Creek Watershed, South Platte Urban Watershed (separate segment 6 and 14 and segment 15 efforts) and Chatfield Watershed. Watershed management efforts are expected to occur in the Boulder and St. Vrain watersheds by 1999. Although a general watershed protection approach has been used in the DRCOG region for water quality planning and management programs, the process has not always applied an integrated, holistic strategy. The goal of the DRCOG watershed protection approach is to apply an integrated, holistic strategy to protect or attain established beneficial uses of waters within regional watersheds, including protection of human health and aquatic ecosystems.

Critical water resources issues

Development patterns, natural physiographic features and special environmental resources (e.g., wetlands, riparian corridors, groundwater aquifers and urban lakes) have affected water quality management planning in the DRCOG region. Some of these environmental resources have been identified by local governments and other agencies as critical regional issues. Policy direction has been developed by the DRCOG Board related to water quality management and protection in wetlands, riparian corridors, groundwater aquifers and urban lakes. Land use patterns have been correlated to surface quality, which requires linking density patterns and distribution trends with regional water quality trends.

DRCOG as a planning agency is responsible for reviewing environmental assessments and environmental impact statements for consistency with adopted policies and management plans identified in the *Clean Water Plan*. The review process is designed to help maintain and protect critical regional environmental resources. Additional regional environmental issues can be evaluated by the WRMAC, the Metro Vision Policy Committee and the DRCOG Board of Directors for policy direction on an as needed basis.

In 1983, DRCOG completed the Denver Regional Urban Runoff Program (DRURP) which studied the nature of urban runoff, its influence on receiving waters, and possibilities for control in the Denver region. Since the DRURP, DRCOG has been involved in six watershed studies, which were designed to assess the nature, severity and impact of stormwater and/or nonpoint sources on water quality. These efforts characterized urban runoff in relation to development patterns. The results have been developed into predictive planning tools, which can be used to estimate stormwater and nonpoint quality, quantity and effects on receiving waters. Best Management Practices (BMPs) are recommended, updated and incorporated as an integral component of watershed management plans. Watershed control includes structural systems, nonstructural practices and institutional policies.

The final rule additions to the National Pollutant Discharge Elimination System Permit Application Regulation for inclusion of a stormwater discharge regulation was issued on November 16, 1990 (Federal Register, Volume 55, No. 222). The phase I stormwater rule regulates stormwater discharges associated with specific industrial discharges, discharges from separate large and medium municipal stormwater systems serving populations over 100,000. The stormwater regulation initially affects the cities of Denver, Aurora and Lakewood. Arapahoe County meets the population requirements based on the 1990 census.

Additionally, other smaller municipalities of less than 100,000 population that lie within the census bureau defined *urbanized area* will be included in phase II of the stormwater permit process by June 1, 2002. The phase II proposed rule was published January 9, 1998 in the *Federal Register* and is scheduled to become final after comments and revision on March 1, 1999. The proposed rule requires six minimum stormwater

management programs be developed by each community: public education, public participation, illicit discharge elimination, construction site runoff control, post construction stormwater management, and pollution prevention for municipal operations.

Proposed and existing water supply projects have a potential to affect water quality and water quality management plans in the metropolitan region. Major water supply projects are a regional issue with long-term water management implications. Through the *Metro Vision Plan* development process, an evaluation of the supply and demand projections for the metropolitan region was completed that suggested demand would exceed the supply between the planning years 2010 and 2015. Development of all potential sources and additional conservation could extend the supply until 2020. *Metro Vision Plan* recognizes that additional water supply projects will be needed to meet the demand in the metropolitan region.

I. INTRODUCTION

In the semi-arid Denver region, our limited water resources are especially valuable assets. The maintenance, restoration and protection of these resources requires coordinated efforts among local, regional, state and federal agencies, along with citizen groups and other interested entities. In the past, waterways in the region were degraded by discharges and runoff associated with urban development, agricultural practices, mining operations and modifications to the waterways.

Local governments recognize that water pollution is both caused by and has negative effects on regional development. A core element of the *Metro Vision 2020 Plan*, adopted by the Denver Regional Council of Governments (DRCOG) Board of Directors in March 1997, acknowledges that the location and type of growth and land development have significant effects on the region's air and water. Even as wastewater and other treatment facilities have improved, water quality goals have become more difficult to meet. Significant regional issues such as stormwater management, construction and nonpoint source pollution, biosolids management, wasteload allocations as part of total maximum daily load setting processes, watershed implementation and screening, water quality monitoring and use of individual disposal systems require innovative, cooperative and affordable solutions.

Local governments recognize that water pollution is both caused by and has negative effects on regional development.

DRCOG is responsible under state and federal statutes for regional water quality planning in the Denver area (Figure 2). In this capacity, the council prepares and updates the *Clean Water Plan*, the management plan for achieving water quality standards pursuant to section 208 of the federal Clean Water Act. The *Clean Water Plan* describes wastewater management strategies, watershed water quality programs, nonpoint source control strategies, stormwater management programs, wasteload allocations, stream standards and priority regional projects. It also contains planning data for up to a 50-year horizon on wastewater treatment facilities. The *Clean Water Plan* provides a regional context for protecting and maintaining water quality through integrated watershed management processes.

Infrastructure development trends

Two critical components for urban development are wastewater service and water supply. Along with transportation facilities, these utilities form the skeleton upon which a region is built. The regional wastewater infrastructure development is characterized and coordinated through the council's *Clean Water Plan*.

The regional wastewater infrastructure development is characterized and coordinated through *the Metro Vision 2020 Clean Water Plan*.

The *Clean Water Plan* appendices identify existing and future wastewater treatment facilities, associated characteristics and service areas. The total number of discharge permits in the region exceeds 250 with many other activities covered by general state permits. Currently, the DRCOG region is served by over 110 permitted domestic wastewater treatment facilities that range in size from one large 185 million gallons/day (MGD) system to 55 small facilities that are sized less than 0.5 MGD. About 6 percent of the population in the region do not receive centralized sewer service and uses individual sewage disposal systems (also generally called septic systems). On a regional basis, these individual systems generate about 13.2 MGD of discharge into groundwater aquifers. The region treats about 230 MGD of wastewater through centralized systems. The combined design capacity of existing wastewater treatment systems is about 321 MGD. Based on 2020 growth expectations, the region will still need at least 20 MGD of additional municipal wastewater treatment capacity.

> Over 94 percent of the regional population is served by centralized wastewater plants capable of treating 321 million gallons of wastewater per day.

The water supply infrastructure development has generally paralleled the wastewater infrastructure development, but with less regional coordination and cooperation. In the past, water supply planning in the metropolitan area was dominated by a few larger water suppliers (e.g., Denver Water Department). There are now over 140 water supply providers, both small and large, developing long-range water supply plans. Based on existing water sources, the demand for potable water is projected to exceed supplies by 2020. The maximum use of available water supplies is not expected to occur without a coordinated effort by all water providers.

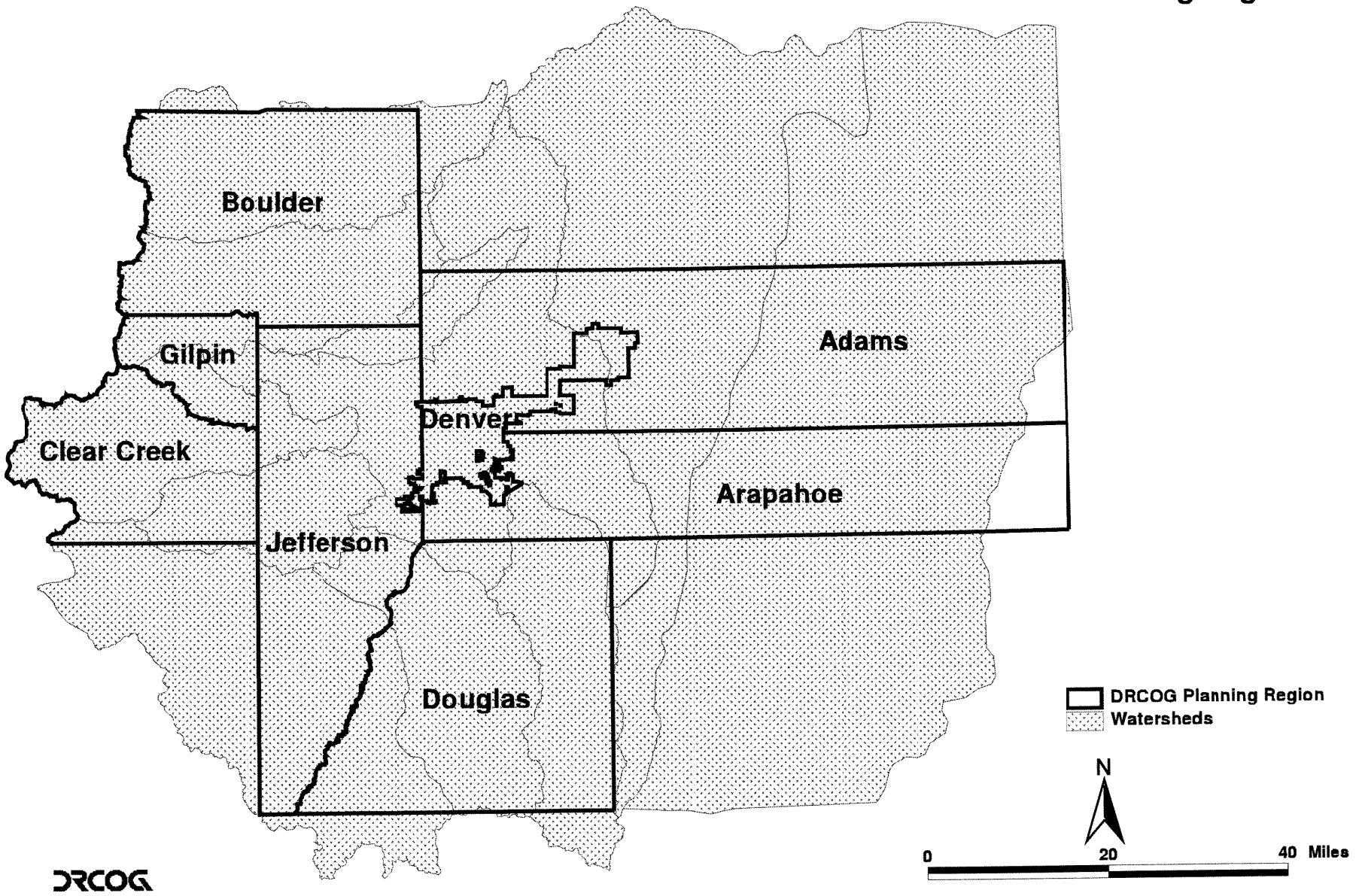
> …the demand for potable water is projected to exceed supplies by 2020.

Typical wastewater treatment or water supply systems are designed to accommodate projected development through at least a 20-year time period, with some long-range system designs established for 50 years or more. Individual facilities are often sized to meet growth projections for the next 10 or 20 years. Some types of facilities such as major interceptors may be sized for the ultimate development anticipated in a sanitary sewer service area. Excess capacity in transmission, collection or treatment facilities has sometimes been used by some communities to subsidize development. As a result, population and employment projections developed for some facility plans became self-fulfilling and resulted in population and flow increases occurring faster than anticipated.

> Local comprehensive plans and zoning have served as major mechanisms for defining water supply and wastewater service areas.

In the region, wastewater and water supply service areas have generally coincided with municipal boundaries or legal boundaries of water and sanitation districts. These operating agencies have traditionally provided all necessary services to their designated service areas. The expansion of these boundaries by local governments through

Figure 2
DRCOG Planning Region



annexations or by special districts enlarging legal boundaries has been used as the primary factor in defining future service areas.

Local plans have been the driving force behind changes to water supply and/or wastewater service areas. In-fill development could be limited in some areas because of insufficient capacity in existing infrastructure and limited opportunities to upgrade these systems.

Since established local government municipal boundaries or special district boundaries frequently do not follow hydrologic boundaries, there can be an increased cost of service associated with this type of urban growth. The wastewater treatment facility for a given municipality or special district can treat wastewater flows from multiple watersheds by using force mains and lift stations at a higher cost compared to gravity flow systems. Duplication of infrastructure can occur within a watershed because of multiple service area designations. This can also result in the under utilization of many transmission, collection and treatment systems.

Since tax base from commercial development and the desire for new growth have been two of the driving factors in urban development, competition has been fierce among local governments and special districts for service area designations. This has created situations where the *Clean Water Plan* has been negatively impacted by localized annexation conflicts. While the approximate 900 square miles of urban development shown in the previous DRCOG *Regional Development Framework* was fully assigned to management and operating agencies, it did not prevent these types of conflicts. The advent of the *Metro Vision 2020 Plan* changed the approach so that infrastructure decisions could be made beyond the 20-year planning horizon and, in some instances, take into account the projected ultimate development of a region. Water and wastewater planning must develop long-range, staged utility plans for the most feasible future service area. Therefore, the *Clean Water Plan* establishes guidance for utility planning agencies, in cooperation with the general-purpose governments they serve, to:

The *Clean Water Plan* establishes guidance for utility planning agencies.

a) identify the areas they intend to serve in the long term (30-50 years); and

b) provide a means to resolve territorial issues related to wastewater service far before facilities are designed and constructed.

Environmental regulations and stream quality standards can function as a restraint to development.

Many of the streams in the metropolitan region are effluent and/or urban runoff dominated. Stricter wastewater effluent limits or stormwater discharge criteria may need to be set through load allocation processes. These regulatory requirements can limit the quantity and/or quality of discharges and can significantly affect the use of existing infrastructure capacities.

In the metropolitan region, water supply is and will remain a limited resource. Although new water sources will be developed for the metropolitan region, there will always be a scarcity of water. Some type of coordinated water supply planning involving the water providers will be needed to maximize water supply capacities. It cannot be assumed that all water providers will find sufficient quantities of water to meet all development expectations. Those water providers with surplus water resources could outgrow those providers with limited capacities.

The DRCOG Board of Directors has defined an urban growth boundary through the *Metro Vision 2020 Plan* process.

Existing infrastructure development trends will need to be coordinated with the urban growth boundary as defined by the *Metro Vision 2020 Plan*, which was adopted by the Board of Directors in March 1997. The *Clean Water Plan* is an integrated part of the *Metro Vision 2020 Plan*, while allowing for cost-effective utility system planning.

Metro Vision 2020 Plan integration

While the *Clean Water Plan* provides strategies and policy direction to preserve and enhance the region's water resources and aquatic environment, the primary link to the *Metro Vision 2020 Plan* is through the wastewater utility plans. This is especially true in light of the role of the *Clean Water Plan* in the state and federal wastewater permitting decision processes. Since many regional streams have flow dominated by wastewater discharges, a critical issue is how to ensure acceptable water quality levels. Additionally, the process must provide sufficient flexibility to establish cost-effective wastewater facilities and recognize the variability of development assumptions made as long as 20 to 25 years before the fact.

The *Clean Water Plan* provides strategies and policy direction to preserve and enhance the region's water resources and aquatic

Wastewater utility plans are a primary link to the *Metro Vision 2020 Plan.*

Water quality management is a regulatory program governed by the federal Clean Water Act and state statute. However, DRCOG's role, as defined in both state and federal law, is not regulatory but planning. As the designated planning agency, DRCOG's approved *Clean Water Plan* provides the guidance to regulatory agencies in making water quality decisions. Based on federal law, no facility permit should be issued which is inconsistent with the approved regional plan.

The *Clean Water Plan* provides the guidance to regulatory agencies in making water quality decisions.

The relationship between the planning agencies, approved plans and regulatory agencies is defined in the *Continuing Planning Process for Water Quality Management in Colorado* as maintained by the Colorado Water Quality Control Commission. This process acknowledges the regulated community role in making water quality management an effective and efficient process through an iterative program. The *Clean Water Plan* reflects the regulated communities' preference for a wastewater management system.

Although future development patterns can affect water management decisions, the focus should be on ensuring protection and maintenance of clean lakes and streams, not using water quality regulation to force some predetermined land use configuration. The *Clean Water Plan* estimates the number of sewer taps needed in areas expected to urbanize in the future. However, it should not be used to drive local land use decisions. Instead, water quality planning should support local decisions at a regional level.

The *Clean Water Plan* is intended to address the protection of water quality with provisions related to wastewater treatment service in light of expected growth of the region. The assumptions about growth are based on the expectations identified in the Metro Vision 2020 plan. To avoid inflexible, regulatory misuse of these assumptions, the following process is defined to provide appropriate flexibility in the application of the *Clean Water Plan*.

The continuing planning process for water quality management places regulatory authority with the Colorado Water Quality Control Commission. The responsibility for implementation is given to the Water Quality Control Division, with the division approving sites for wastewater treatment systems (such as treatment plants, lift stations and interceptors) and issuing wastewater treatment discharge permits. The site approval process, by state statute, is required to consider recommendations contained in the *Clean Water Plan*.

While the division can approve sites that are inconsistent with the *Clean Water Plan*, they are required to notify DRCOG of this action and provide an explanation for their action. Historically, however, the division's decisions on site locations for major treatment facilities have been generally consistent with the plan. However, in some past cases, the Water Quality Control Division has made decisions that were not consistent with the plan. The siting of 15 small treatment facilities (under 50,000 gallons per day capacity) were approved by the division prior to being recommended in the plan. The plan recognized these facilities after permits were issued.

The federal Clean Water Act requires that discharge permits also be consistent with water quality management plans such as the *Clean Water Plan*. However, in Colorado the permit system has not defined what such consistency means. It appears that the division assumes that the site approval and continuing planning processes have addressed any consistency issues and they have issued permits without direct reference to the *Clean Water Plan*.

Five factors determine consistency of permit and site applications: location, sizing, staging, service area and effluent

The *Clean Water Plan* identifies five factors for determining consistency of permit and site applications: location, sizing, staging, service area and effluent quality. Three of these (sizing, staging and service area) are growth related. DRCOG has used forecasts from its regional development plan to calculate sizing and staging needs of treatment facilities and used the extent of expected development to refine locally defined service areas. The ability of DRCOG to project regional growth trends has been very good.

Greater variability in predicting growth trends occurs at the site specific level. Flexibility in sizing and staging has worked well.

Service area definitions serve two purposes in the *Clean Water Plan*. First, service areas define the total extent of service expected during the planning period. Secondly, service areas identify the appropriate boundaries between individual wastewater treatment facilities. This enables each facility to conduct its own planning with the assurance that no other facility is planned to serve the same area.

Two types of service areas are: *utility service areas* and *CWP planning areas*.

Since it is easier to forecast levels of expected regional growth than it is to identify locations where short-term growth will occur, the *Clean Water Plan* recognizes two types of service areas: *utility service areas* that are consistent with the Metro Vision 2020 extent of urban growth; and *CWP planning areas. CWP planning areas* are either equal to utility service areas or larger. Planning areas can be based on existing local comprehensive plans, comprehensive long-range utility plans or the area a wastewater treatment provider intends to serve at ultimate development. The *utility service area* map shows the Metro Vision 2020 extent of urban growth. The *CWP planning area* map shows planning areas including those potential service areas beyond the Metro Vision 2020 extent of urban development.

Wastewater treatment facilities and appropriate management agencies will have consistent *CWP planning area* designations mapped and maintained through the *Clean Water Plan*. Overlapping *utility service areas* or *CWP planning areas* will *not* be recognized in the plan. Local resolution of overlap issues will be required before there is regional recognition. The *CWP planning area* maps, as included in technical appendices to the *Clean Water Plan*, will be used by DRCOG in the site application review process. New transmission or treatment facilities designed to fully serve development outside *utility service areas* will not be recommended.

Utility plans are encouraged for each planning area. Utility plans will document the wastewater management strategy for a wastewater treatment facility (greater than 2,000 gallons per day capacity) and the associated utility service area and planning area. Metro Vision forecasts of employment and population will be included in utility plans to calculate wastewater flows and resulting impacts on the receiving groundwater, river, stream or lake.

The *Metro Vision 2020 Plan* linkages allow the *Clean Water Plan* to remain flexible, collaborative and ff

Using this process ensures that DRCOG's review of site applications, discharge permits and other water quality reviews is based on growth assumptions that reflect regional and local consistency. The combined use of utility service areas and planning areas can accommodate the uncertainty associated with the location of future development. Further, given the annual opportunity established by the Board to review and amend all of its regional plans, significant changes in assumptions or factors influencing regional growth and development can be addressed

on an ongoing basis to ensure added flexibility. The Metro Vision linkages allow the *Clean Water Plan* to remain flexible, collaborative and effective, while incorporating mechanisms to help local governments in voluntarily meeting water resources goals.

Flexibility provisions

The urban growth boundary's flexibility provisions, as approved by the DRCOG Board of Directors, use the term "*consistent with the Clean Water Plan"* as recommended by the WRMAC. The following recommended guidance can be used to determine *consistency with the Clean Water Plan* when a change is proposed to an accepted urban growth boundary.

A community going through a self-certification process to modify the urban growth boundary should consider seven topics.

A community going through a self-certification process to modify the urban growth boundary is encouraged to consider the following seven topics before notifying DRCOG of a change. If the community is unable to respond to these topics, the Metro Vision Policy Committee would require this analysis as part of a level II revision.

1. An urban growth boundary change should be consistent with the accepted wastewater utility plan or, when a utility plan is lacking with the *Clean Water Plan*, as follows:

- the area proposed to be added to the urban growth area ("revised area") must be shown on the *Clean Water Plan planning area/utility service area map* as approved by the DRCOG Board of Directors through the Metro Vision Plan Assessment Process. In the interim period prior to approval of any specific utility plan and the accompanying clean water plan planning area, the revised area must be within a community's planned growth area as shown in its adopted comprehensive plan;

- the affiliated utility department or management agency should determine that it is feasible to provide permanent wastewater service consistent with an accepted wastewater utility plan or the *Clean Water Plan*; and

- the revised area does not result in an unresolved overlap with other utility service areas or *Clean Water Plan* planning area(s).

- If there is an existing total maximum daily load allocation(s) or a site-specific wasteload allocation associated with the area, then go to topic 3. Otherwise, based on quantified analysis, substituting the revised area for an existing urban growth area should not cause the existing water quality standards to be exceeded for a period of five years.

- for site-specific receiving waters (i.e., streams, rivers, lakes, reservoirs or groundwater); and

- for downstream water bodies in contiguous watersheds due to accumulative loading of pollutants of concern.

3. If there is an existing total maximum daily load allocation(s) or a site-specific wasteload allocation, then the review should determine that the proposed change(s) does not violate the assumptions of an approved TMDL(s) or alter the allocation(s) to point sources, nonpoint sources or stormwater including the following:

- model runs or other calculations using the revised area shall be prepared and must be reviewed with other affected stakeholders before the community proposing the revised area makes a determination of no effect;

- point source, nonpoint source or stormwater discharge allocations set within other portions of the associated watershed or upstream watershed (i.e., the change can not cause an upstream water quality standard(s) or total maximum daily load allocation(s) to be modified); and

- pollutants of concern which should include but are not limited to those regulated by permits as listed in the *Clean Water Plan* or contained in the Colorado Water Quality Control Division 303(d) List;

4. If a stream segment is listed in the Colorado Water Quality Control Division 305(b) Report as needing a potential total maximum daily load allocation or a wasteload allocation study, then any type of data analysis done by the certifying community should be reviewed with the affected stakeholders before a determination of *no effect* is concluded.

5. The urban growth boundary change does not create inconsistencies between or require alterations in local water quality management programs, state control regulations or other adopted regional policies.

6. The revised area will make no change to the following treatment works components as identified in the *Clean Water Plan* or a wastewater utility plan referenced and accepted in the *Clean Water Plan*, including but not limited to:

- facility siting;

- facility sizing (i.e., change to design capacity);

- effluent limits; or

- long-range or planning horizon projections.

7. If the community has a stormwater permit, the proposed urban growth boundary should be consistent with any provisions listed in the permit. A boundary change should have no negative effect on an approved watershed or regional stormwater management plan(s).

Regional policy guidance on water quality

Goal

25-year process

The 25-year process defined through the *Clean Water Plan* is to draw upon existing and projected water quality assessments at the watershed level to identify priority point, nonpoint and stormwater quality problems.

The plan recommends appropriate measures and solutions, including the system of treatment works or facilities, management agencies, financial, institutional measures and management strategies, necessary for implementation of recommended solutions. Recommendations in the *Clean Water Plan* are consistent with the objectives and goals of the federal Clean Water Act, Colorado Water Quality Act and regional watershed programs. The objective of the federal Clean Water Act *...is to restore and maintain the chemical, physical and biological integrity of the nation's waters*. Based on this federal objective and consistent with the State Water Quality Act, the goal for the region is *to restore and maintain the chemical and physical integrity in order to assure a balanced ecological community in waters associated with the region*.

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DRCOG function

Stakeholders within the region have a wide variety of interpretations on the meaning of *restoring and maintaining the chemical and physical integrity, and a balanced ecological community*. As a result, meeting the regional goal to the satisfaction of all stakeholders is probably not achievable by the planning horizon of 2020. However, the quality of the region's water bodies and surrounding land uses will be preserved and enhanced through the implementation of strategies recommended in the *Clean Water Plan*. It is recognized that water quality and availability of water supplies influences, and is influenced by, development patterns.

The management planning process is used to recommend implementation strategies to restore impaired water resources.

The management planning process is designed to recommend state water quality standards, address water quality and related environmental issues associated with regional growth and recommend implementation strategies to restore impaired water resources. The planning process is continuous and iterative. As solutions are found to many of the more

pressing pollution problems, other issues and problems need solution. The policies in the *Clean Water Plan* are designed to steer this process. DRCOG coordinates all regional water quality issues, dealing with a variety of hydrological systems including rivers, streams, lakes, reservoirs, wetlands and groundwater systems. Regional issues include water quality trends, water quality standards and classifications, wastewater and biosolid processing and disposal practices, groundwater quality, recharge zones, land use patterns (i.e. open space), wetlands, nonpoint source pollution, stormwater runoff, urban lakes, water supply and other environmental constraints.

DRCOG reviews proposed projects in context with these regional issues which can include National Pollutant Discharge Elimination System (NPDES) permits, Colorado Discharge Permit System (CDPS) applications, large-scale land uses, 404 permits (Section 404 of the Clean Water Act regulates dredge and fill operations), environmental assessments and impact statements, a variety of water quality projects associated with urban runoff and issues related to mitigating negative effects from a variety of non-point sources of pollution.

Eleven watersheds are recognized in the eight-county region.

The DRCOG Board of Directors has accepted a watershed approach that recognizes 11 watersheds in the eight-county region (Figure 1, on page 11). Watersheds define water quality and wastewater management planning areas. Hydrologic features and geographical considerations were used to establish watersheds. Some of the watersheds define actual discrete hydrologic drainage systems or stream/river watersheds, while others are more complex hydrologic systems. From a regional perspective, the water quality of each watershed affects downstream or contiguous watersheds.

Solving water resources issues through an integrated process requires innovative, cooperative and affordable solutions for a number of critical regional water quality, water resources and environmental topics. The areas of DRCOG involvement, assistance or interest include the following regional water resources topics:

- an integrated watershed approach for all 11 watersheds in the region;
- stormwater, construction and urban runoff assessment and management;
- nonpoint source pollution and best management practices;
- a system of wastewater treatment works or facilities needed through the planning horizon, currently set at 2020;
- biosolids management and regional policy;
- wasteload allocations and the total maximum daily load process as defined by the Environmental Protection Agency (EPA), the Water Quality Control Commission and the Water Quality Control Division;

- groundwater quality and protection;
- water quality standards and classifications of water bodies;
- restoration and maintenance of impaired beneficial uses, such as water supply, aquatic life, recreation and agriculture;
- water quality monitoring and trend characterization;
- biological and physical habitat evaluations;
- regional significant wetlands and regional policy; and
- environmental constraints and other water quality protection programs.

Regional objectives

Substantial efforts will be needed to resolve problems and find workable

Even as treatment facilities have improved, water quality goals have become more difficult and costly to meet. The physical, biological and ecological characterization of the region's water resources has just begun, and substantial efforts will be needed to resolve problems and find workable solutions. Since the council has authority under state and federal statutes to maintain a bottom-up planning process, the following five key objectives were adopted as part of the *Metro Vision Plan* to support a proactive regional planning process.

1. A locally defined "balanced ecological community" will be achieved through implementation of water quality protection and appropriate water resource management initiatives, provided that a balance will be maintained between the natural environment and those designated uses of the resource.

Defining balanced ecological communities requires input from local, regional, state and federal

In 1970, more than 60 percent of all waters in Colorado were polluted and much of the environment associated with these water resources was damaged. This trend is still evident by the number of impaired stream segments in the DRCOG region (Figure 3). Federal and state laws were established that allowed the continued use of these resources, while requiring restoration and protection from further degradation. Any use of a resource can cause problems.

The best solution is to find an *acceptable* level of change that keeps the environment healthy without losing those uses (water supply, agricultural irrigation, recreation, fisheries and wildlife) which are important to us. The identification of acceptable levels of change in the environment is called a *balanced ecological community*. The definition of these ecological communities will be a basic part of all water resources management plans. Since local funding and resources are

required to maintain balanced communities, locally developed criteria will be used to identify acceptable levels.

Based on federal and state law, acceptable levels can be established by federal or state agencies producing a top-down process. The *Clean Water Plan* is recognized by federal and state agencies as the areawide management plan, which advocates a bottom-up process. Consequently, one key element of the plan will be to establish an "acceptable" goal that balances communities and aquatic environments, while promoting the beneficial uses of regional water resources.

2. The chemical and physical integrity of the region's aquatic environments will be restored and maintained through a coordinated watershed management process.

Coordinated watershed management process

Over the last few years interest has increased in Colorado and across the nation in a more complete and integrated approach to environmental and natural resource management. These efforts are most logically rooted in a determination of the overall water quality uses and values to be protected or achieved in a particular watershed. Federal and state programs are moving toward an increased emphasis on watershed protection with increased local involvement. The *Clean Water Plan* has adopted a watershed approach with 11 mapped watersheds (Figure 1 on page 11). The watershed approach as outlined in the *Clean Water Plan* is a bottom-up process that incorporates federal or state recommendations into local implementation strategies. In view of these considerations and developments, it is critically important for the region to be proactive in identifying an approach to watershed protection that will be constructive and effective at the regional and local levels.

Since restoring and maintaining the chemical quality and physical features of streams, lakes and other water resources can best be achieved at the watershed level, the plan identifies appropriate watershed management strategies. Solving water resources problems through watershed management will result in better long-term solutions, more cost-effective solutions, and involves all of the interested community.

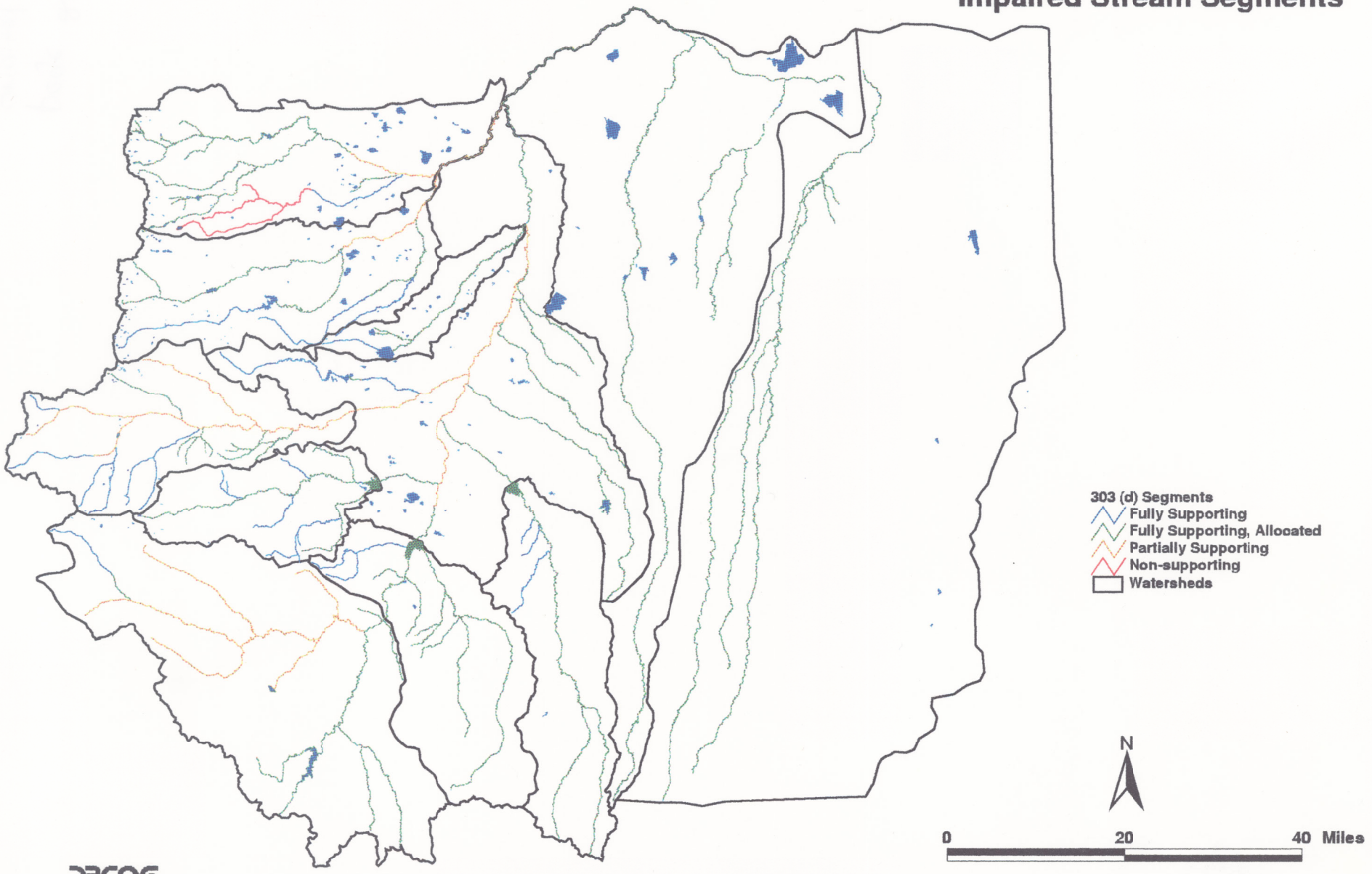
3. Effective wastewater treatment will be identified through a regional process, with local implementation of wastewater management strategies.

Wastewater management strategies

The treatment of wastewater to meet applicable standards is required by federal and state law. Many streams now flow year-round because of treated wastewater discharges. Treatment efforts are an important step in the management of water quality in streams, lakes and other water resources. The location, type of treatment works, quality of the discharge and total number of treatment plants can greatly affect the quality of water in this region and beyond. The large number

Figure 3 Impaired stream segments in DRCOG region

Figure 3
Impaired Stream Segments



(more than 110) of domestic treatment works that discharge into hundreds of miles of streams can cause an accumulated impact to water quality (Figure 4). Regional evaluations are necessary to determine and resolve these accumulated impacts.

The *Clean Water Plan* identifies the type of wastewater management needed to restore or maintain these water resources. Since wastewater treatment systems are built to last more than 20 years, careful long-term planning is needed to keep these systems cost effective. The wastewater management information in the plan is used by the federal and state regulatory agencies to issue permits.

4. Effective and balanced stormwater and nonpoint source management can best be achieved through local implementation processes.

Stormwater and nonpoint source

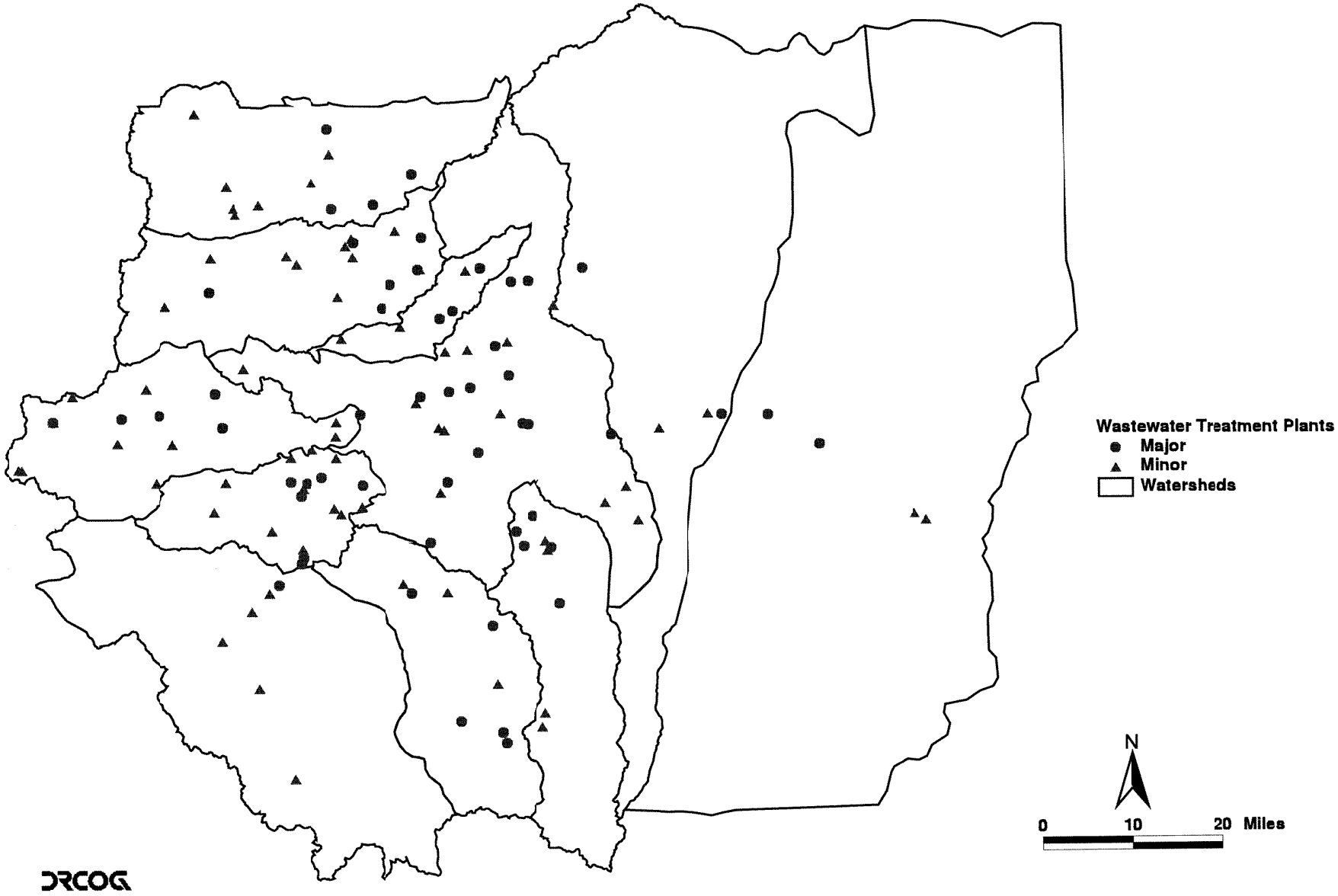
Runoff from urban areas during storms (stormwater) and runoff called nonpoint source pollution (from non-urban land areas and generally not carried in a pipe) is a water quality problem in the region. Stormwater runoff in large U.S. cities is now regulated. Treatment of stormwater runoff from developed areas at the end of drainage pipes or channels can be extremely difficult, expensive and is not cost-effective. Therefore, the preferred approach is locally-based implementation programs based on common-sense practices called "best management practices" to improve the quality of runoff.

Other nonpoint sources, besides urban runoff, include mine water discharges, agricultural return flows and water quality changed by diversions or impoundments called hydro-modification. Local control (e.g., zoning regulations, subdivision ordinances, building permits, development code) and implementation of *best management practices* (BMP), is the most effective, least expensive way to prevent runoff pollution problems.

Conservation and wastewater reuse programs are essential strategies that will be used to help meet the unmet water supply demand. These programs have the potential to alter (for better or worse) surface water and groundwater quality.

Some treated effluent dominated streams may be altered as urban runoff and return flows begin to dominate these streams. The quality of return flows to either streams and lakes or groundwater sources is a concern to many communities in the metropolitan region. A regional water supply study based on current metropolitan water supply studies and other local water provider inputs linked with the Metro Vision 2020 extent of urban development could assist in regional coordination of local decisions. Regional water demand forecasts would then be evaluated against all appropriate water quantity and quality information. The resulting integrated planning document would be available for use in decision processes.

Figure 4
General Locations of Wastewater Treatment Facilities



Federal Clean Water Act

Congress took major steps in ensuring future generations of the highest level of water quality protection with the passage of the federal Clean Water Act, Public Law 92-500 (as amended in 1977, Public Law 95-217 and 1987, Public Law 100-4). Meeting the goals of the act requires a comprehensive and integrated approach to water pollution abatement. Section 208 of the act provided criteria and a mechanism to use local plans within a regional context to meet the goal of the act.

Planning is based upon a comprehensive and integrated approach to water pollution abatement as required by the federal Clean Water Act.

To maximize the efficient use of resources, the areawide approach to planning is based upon a comprehensive and integrated approach to water pollution abatement, which ensures goals of the act are achieved within the framework of local needs and requirements. The state of Colorado has continued to use regional planning agencies, as defined in the act, for regions of the state with multijurisdictional organizations.

The role of areawide planning agencies in water quality management is defined in the act, along with the definition of water quality management plans. Water quality management plans (40 CFR 130.6) consist of initial plans produced in accordance with sections 208 and 303(e) of the federal Clean Water Act and certified and approved updates to those plans. Continuing water quality planning is based upon water quality management plans and water quality problems identified in the state water quality inventory reports 305(b). Water quality management plans are used to direct implementation. These plans draw upon the water quality assessments to identify priority point and nonpoint water quality problems, consider alternative solutions and recommend control measures, including the financial and institutional measures necessary for implementing recommended solutions.

Role of areawide planning agencies

Sections 205(j), 208 and 303 of the act specify water quality planning requirements. The required elements of water quality management plans are total maximum daily load studies and results, effluent limits, municipal and industrial waste treatment, nonpoint source management and control, residual waste, land disposal, agriculture and silviculture, mining, construction, urban stormwater, implementation measures, dredge and fill, watershed plans and groundwater. The water quality management plans must also include requirements for necessary urban stormwater runoff systems as established under the stormwater permitting program. The *Continuing Planning Process* required in section 303(e)(2) of the act and (40 CFR 30.5) as implemented through the Colorado Water Quality Act (Colorado Revised Statutes 1973, 25-8-101) and further specified in the rules, regulations and policies of the Water Quality Control Commission defines the elements of areawide 208 plans for Colorado.

Continuing Planning Process

Total maximum daily loads (TMDLs) and individual water quality-based effluent limits are included in water quality management plans in accordance with sections 303(d) and (e)(3)(C) of the act and section 130.7 of CFR 40. The required TMDL elements include setting priorities for wasteload allocations and load allocations, establishing these loads for segments requiring allocations, including water quality monitoring, modeling, data analysis, calculation methods, and list of pollutants to be regulated. All watersheds require TMDL analyses according to the act, even if no pollutant has been designated as a problem.

Water quality management plans must identify a system of treatment works or facilities necessary to meet the anticipated municipal and industrial waste treatment needs of the area over a twenty-year period (40 CFR 130.6) in accordance with section 208(b)(2) (A) and (B) of the act. Water quality management plans identify management agencies necessary to carry out the water quality management plan and provision for adequate authority for intergovernmental cooperation in accordance with sections 208(b)(2)(D) and 303(e)(3)(E) of the act. Management agencies recommended by areawide water quality management agencies (40 CFR 130.9) must demonstrate the legal, institutional, managerial and financial capability necessary to carry out their responsibilities in accordance with section 208(c)(2)(A) through (K) of the act.

The 1987 amendments to the act changed implementation and water quality planning. PL100-4 phased out the construction grant program and substituted a state revolving loan program. Colorado has developed a revolving loan program. The program is currently established to finance wastewater projects and nonpoint source projects. About 4 percent of the fund is used to offset operations, administration and planning efforts.

Stormwater projects and drinking water supply projects are also available for loans. The program can be used to refinance local debt obligations or construct municipal systems. Section 406 addresses the increasing concern about toxics. The EPA requires the identification of toxics in biosolids with numerical limits for maximum toxic concentrations. Biosolids management practices are also required as part of the biosolids regulations. To implement these toxic requirements, section 402 requires the National Pollutant Discharge Elimination System (NPDES) permits to be modified to include biosolids management.

Section 402 NPDES permits regulate separate storm sewers with section 405 phasing in stormwater permits. The phase I stormwater regulation was enacted by the EPA in November 1990. Section 301 gives industrial dischargers additional time to meet Best Available Technology (BAT) and Best Control Technology (BCT) effluent limitations. The EPA-s flexibility in negotiating permit limitations on any given facility is restricted by sections 306 and 404. Section 306 allows for alternative BAT and pretreatment standards for existing facilities based on variances. Section 404 established the antibacksliding requirement that prevents modifying a permit to have less stringent requirements than included in the original permit.

Section 309(g) provides a two-tiered administrative penalty system with more stringent civil and criminal judicial penalties. Hazardous substances in section 309 include reference to other environmental statues: *Comprehensive Environmental Response, Compensation and Liability Act* (CERCLA) of 1980; *Federal Resources Conservation and Recovery Act* (RCRA) of 1976; *Installation Restoration Program* (IRP) of 1986; and a U.S. Department of Energy site under the *Radiation Control Act* of 1978.

The 1987 amendment emphasizes state responsibility for daily implementation of the requirements of the act. States have more responsibility for financing, management and control of toxics and nonpoint source pollution. Section 316 requires each state to develop a nonpoint source assessment report and management program. Section 319 authorizes grants for demonstration and education programs to begin implementation of the state management program. Section 308 establishes a toxics program which results in additional biomonitoring requirements. Section 402(p) established the regulation for industrial and municipal stormwater sources.

Regional planning consistency requirements

Discharge permits are issued to dischargers in accordance with section 208(e) of the act. This section states that *no wastewater discharge permit (NPDES) may be issued which is in conflict with an approved water quality management plan*. When a state has assumed responsibility for the administration of the permit program under section 402, it must assure consistency with the water quality management plan (40 CFR 130.12(a)).

> *…no wastewater discharge permit (NPDES) may be issued which is in conflict with an approved water quality management plan.*

Construction grants and revolving loan programs must be consistent with section 208(d) and 603(f) of the act. After a management agency has been designated and a water quality management plan approved, section 201 construction grant or section 603 revolving loan funds may be awarded only to agencies for construction of treatment works in conformity with the water quality management plan (40CFR 130.12(b)).

State Water Quality Act

> The *Colorado Water Quality Control Act* provides policy direction to conserve, protect, maintain, and improve the quality of state waters.

The Colorado Water Quality Control Act (Colorado Revised Statutes 25-8-101 through 25-8-702) provides the policy direction to conserve, protect, maintain, and improve, where necessary and reasonable, the quality of state waters. The act authorizes water pollution prevention, abatement and control programs. The act establishes regional wastewater management plans (Colorado Revised Statutes 25-8-105) which include plans known for the purpose of the federal act as *208 plans* developed by designated planning agencies.

In Colorado, the Colorado Water Quality Control Commission (WQCC) regulates water quality and is responsible for establishing classifications and standards to protect

beneficial uses of streams, lakes and groundwater in the state (Colorado Revised Statutes 25-8-201 through 25-8-406). This planning process maintains water quality standards and addresses water quality issues associated with regional growth.

The act creates the Colorado pollutant discharge permit system (Colorado Revised Statutes 25-8-501 through 25-8-506) which requires any person discharging pollutants into state waters to obtain a permit from the Water Quality Control Division of the Colorado Department of Public Health and Environment. The Water Quality Control Commission is responsible for promulgating regulations necessary for the orderly and effective administration of permits. The act sets permit fees and facility categories and subcategories. Violations, remedies and penalties are defined in the act (Colorado Revised Statutes 25-8-601 through 25-8-612). Domestic wastewater treatment works are defined in Colorado Revised Statutes 25-8-701 through 25-8-703.

Regional planning consistency requirements

The commission can approve, conditionally approve or reject a management plan or an amendment to a management plan.

The regional planning agency submitting either a water quality management plan or an amendment to a management plan to the Water Quality Control Division is required to hold a public hearing. After the hearing, the management plan or amendment to the plan is reviewed by the division prior to consideration by the Water Quality Control Commission. The commission, after notice and hearing, can approve, conditionally approve or reject a management plan or an amendment to a management plan. The governor may certify to the EPA a regional management plan or an amendment to a management plan, which has been approved by the commission.

Water Quality Control Division must consider any approved regional wastewater management plan.

In evaluating the suitability of a proposed site for a domestic wastewater treatment facility the Water Quality Control Division must consider any approved regional wastewater management plan for the designated area. State law encourages the consolidation of wastewater treatment facilities as part of the approval process.

II. REGIONAL WATER QUALITY ASSESSMENT

Standards and classifications are the responsibility of the Water Quality Control Commission.

The Colorado Water Quality Control Act vests the responsibility for establishing stream classifications and water quality standards, as well as various regulations aimed at achieving compliance with these standards and classifications with the Water Quality Control Commission. Since the initial set of classifications and standards was promulgated in 1966, the commission has been involved in revising the classification system as required by state and federal law. This process is described in the *Colorado Water Quality Management and Drinking Water Protection Handbook: A Continuing Planning Process* (Commission policy #98-2, June 1998)

The Water Quality Control Division of the Colorado Department of Public Health and Environment (CDPHE) has a responsibility to assess whether there is a need for additional water quality data to make recommendations on standard changes to the Water Quality Control Commission. In most cases, the availability of the database is a function of the number and types of discharges to the particular stream, or the importance placed on the stream by individuals, municipalities, or industries. The final classifications and standards are incorporated into areawide plans and used as the basis for local recommendations in any planning-related decisions. Additionally, areawide plans are used to recommend changes to standards and classifications based on local or regional data evaluations and local or regional preferences for beneficial uses.

The Clean Water Plan is used to recommend changes to standards and l f

Impaired stream segments

Section 305(b) of the federal Clean Water Act requires states to prepare and submit a report biennially to the EPA on the status of water quality within the state. The report provides a means for states to report to the EPA and Congress on the quality of their waters, the status of water quality management programs and the environmental impacts, and social and economic costs and benefits associated with achieving the objectives of the Clean Water Act.

The biennial *305(b) Report* identifies water quality limited segments.

The 305(b) report is a mechanism for Colorado to identify water quality limited segments, including lakes, reservoirs and groundwater sources. Water quality limited segments are those segments in which stream standards are exceeded, or expected to be exceeded, after point source dischargers have met applicable technology-based

effluent limitations required by sections 301(b) and 306 of the Clean Water Act. The 305(b) report also sets general criteria to be used by stakeholders for stream segments, which could require, after listing on the 303(d) List, either a wasteload allocation evaluation or a complete TMDL process. The criteria that has been used by the Water Quality Control Division is as follows.

- more than one discharger located on the segment;
- classifications and standards are or may be impaired in the future by discharge of pollutants;
- segment is threatened by new or expanded discharges;
- wasteload allocations established in prior 303(e) or areawide planning need re-examination because of changed conditions or new data;
- permits nearing expiration which discharge into water quality limited segments and require mass balance calculations to set effluent limits; and
- dischargers on a segment ready to proceed with a load allocation analysis.

These criteria are used to generate a list of stream segments for inclusion in the 305(b) report. The state uses a number of information sources to prepare the 305(b) report. Monitoring information comes from Water Quality Control Division monitoring program, special stream studies conducted by a variety of public or private agencies, and water quality assessment sections of areawide management plans. The 305(b) report generally does not list steps taken by management agencies to improve water quality in problem stream segments.

The *303(d) list* identifies and prioritizes waters requiring pollution abatement

Section 303(d) of the Federal Clean Water Act requires states to prepare and submit a list biennially to the EPA listing waters which do not, or may not meet water quality standards after the application of technology based controls for point sources and other controls for nonpoint sources. The 303(d) list identifies priority waters requiring a TMDL process. The 303(d) list is used to set pollution abatement program priorities that are then incorporated in areawide management plans.

In previous 305(b) reports and annual reports, the Water Quality Control Division used classification terminology of fully supporting, threatened, moderate impairment and severe impairment. In the 1996 305(b) report, the division changed its classification to fully supporting, water quality limited allocated, water quality limited, partial support and not supporting. The designated use impairment criteria were based on water quality information, biological information, direct observation and best professional judgement for

both conventional pollutants and toxic pollutants. In the 1998 303(d) listing process, the use attainment definitions were modified as shown in Table 1.

The Colorado Water Quality Control Division, along with the TMDL Advisory Committee, produced the following listing and de-listing criteria used to develop the 1998 303(d) List.

Table 1 Designated Use Attainment Definitions

(Adapted from the Colorado's 1998 303(d) List)

Degree of Designated Use Support	Water Chemistry Information	Physical and Biological Information
FULLY SUPPORTING: Designated uses have been attained and are supported.	The 85th percentile[1] data point is below the applicable chronic stream standard[2]. No exceedences of the acute water quality standard.	Results of physical and biological assessments indicate the use is not impaired.
FULLY SUPPORTING, ALLOCATED: Designated uses have been attained and are supported but the assimilative capacity of the segment has been allocated.[3]	The 85th percentile data point is below the applicable chronic stream standard[2]. No exceedences of the acute water quality standard.	Results of physical and biological assessments indicate the use is not impaired.
POTENTIALLY IMPAIRED: Designated uses are not materially impaired, but assessment information or segment specified water quality-based controls indicate the potential for impairment within two years.	The 85th percentile data point equals or approaches the chronic water quality standard[2] and data indicate a trend of deteriorating water quality which could impair uses within two years. No exceedences of the acute water quality standard.	Results of physical and biological assessments indicate the use is not impaired, but also indicate a trend of deteriorating water quality which could impair uses within two years.
PARTIAL SUPPORT: At least one designated use exhibits some interference, but use is not precluded.	The 85th percentile data point exceeds the chronic water quality standard[2]. No more than one exceedence of the acute water quality standard.	Results of physical and biological assessments indicate partial use impairment.
NOT SUPPORTING: At least one designated use is materially impaired. Use may be present but at significantly reduced levels from full support in all or some portions of the segment.	The 75th percentile data point exceeds the chronic water quality standard[4]. Occasional or frequent exceedences of the acute water quality standard.	Results of physical and biological assessments indicate use impairment.

Notes: [1]"Percentile@ The values obtained by (m)n) x 100, where m = the rank of observation in the data set ordered from high (m=n) to low (m=l); and n = the number of data points.

[2] The 50th percentile point is used for metals in the total recoverable form (e.g., Iron)[3] For segments which have domestic wastewater treatment plant discharges, this full allocation may occur some time in the 20-year planning horizon. Current discharges may not reach their full allocation.

[4] The 45th percentile point is used for metals in the total recoverable form (e.g., Iron).

Listing criteria

303(d) listing criteria

Segments are included on the 1998 303(d) List if they meet one of the following listing criteria.

1. Segments which have temporary modifications of standards.

2. Segments which are shown to have designated use impairment (Not Supporting, Partially Supporting, or Potentially Impaired) based on review of Credible Evidence (see below).

De-listing criteria

303(d) de-listing criteria

Segments which met the above listing criteria have been removed from the 1998 303(d) List if the following conditions applied.

1. Segments where federal, state, or local requirements are stringent enough to attain water quality standards.

2. Segments where approved TMDLs address all the pollutants of concern.

Credible evidence

303(d) credible evidence

Credible evidence is a new term that applies to the quantity and quality of data that is available for making decisions regarding the water quality designations of a stream segment. Colorado's 1998 303(d) List identifies credible evidence as follows:

> *Segments are included on the 303(d) List based on an evaluation of biological, chemical or physical data demonstrating numeric or narrative standards violations, use impairment or a declining trend in water quality or biotic community such that standards could be exceeded prior to the next listing cycle. However, it is important that the decision to list a water body be based on credible evidence, rather than anecdotal information. The following guidelines have been developed to assist during evaluation of water quality information.*

- *Information is available to describe the methods used for sample collection and field or laboratory analysis.*

- *Sufficient information and data are available to indicate that the measurements represent existing conditions.*

- *In general, information and data should be no older than five years. Older data may be used on a case-by-case basis if the Division believes conditions have not changed and that this older data is still representative or the older data is used with newer data to determine trends.*

- *Physical and biological assessments are performed by an observer who has training and experience in performing such observations, and recorded observations adequately account for seasonal variation.*

Credible evidence will result in a stream segment listing (305(b) & 303(d)) if a numeric or narrative criterion exceedence is revealed or beneficial use impairment is identified. Technical analysis (modeling) may also be used to predict potential probable numeric exceedence of stream standards or use impairment. Narrative criteria, observations and professional judgment, may be labeled credible only if the observer has training and experience in performing such observations. Observations must be documented and should adequately represent any expected seasonal variations.

Combining the 305(b) report and 303(d) list provides a characterization of the potentially impaired stream segments within the region. The 305(b) report and 303(d) list were updated in 1998 based on guidance issued by the EPA and procedures being developed by the Water Quality Control Division (WQCD 1998).

Recommended changes to the 303(d) List and 305(b) Report

Based on local input and regional analysis, the recommended 303(d) list is shown in Table 2. Table 3 lists those segments in the region that are recommended by the Water Quality Control Division to be monitored before listing on the 303(d) list. Table 4 shows those segments that could be included in the 305(b) report based on existing water quality data. Critical parameters of concern by watershed are shown in Table 4.

Local governments have identified a significant problem related to the availability and acceptability of water quality data.

Table 5 lists some of the EPA-accepted TMDLs for the region. Additional TMDLs have been accepted by the EPA through the Colorado discharge permit system. Wastewater discharges into water quality limited segments require a mass balance calculation to establish effluent limits for selected parameters. These permits are being submitted by the Water Quality Control Division to the EPA as TMDLs. Permit specific TMDLs may not provide a watershed level allocation for selected parameters of concern. The 1998 303(d) list Appendix D includes all permits that expire before April 1, 2000. When these permits are reissued permits, they will be viewed by the Water Quality

Control Division as site-specific TMDLs. Permit-specific TMDLs should be considered in local utility planning activities.

Dependent on which data sets are used and how trend data is interpreted, a different water quality assessment can emerge. A better water quality characterization of trends needs to be systematically developed for stream segments in the DRCOG region using methodology acceptable to the Water Quality Control Division. Local management agencies are willing to spend funds on water quality data collection, if this data is used in the 305(b) report and subsequent 303(d) listing.

A large number of sites (>100) have been monitored in the region. These sites are located on the main stem of the South Platte River, tributary streams, small creeks and lakes and reservoirs. The distribution of trend stations needs to have maximum application for watershed management and remain as cost-effective as possible.

>100 monitoring sites in

Standards and classifications

The *Clean Water Plan* recognizes the stream classifications and standards adopted by the Colorado Water Quality Control Commission.

The commission is responsible for establishing beneficial use classifications and numeric water quality standards on all streams and lakes in the state. Based on assigned beneficial uses, these stream segments have basic and numeric water quality standards intended to maintain water quality at a level sufficient to protect the classified uses. Most streams are required to be in compliance with over 100 numeric standards. The standards and classifications of stream segments by watersheds are maintained in the technical appendices of Part II of the *Clean Water Plan*. These standards and classifications tables will be periodically updated to reflect actions taken by the Water Quality Control Commission.

Processes to change standards and classifications

The Water Quality Control Commission uses the triennial review and rulemaking hearing processes to revise stream classifications and/or standards. The policy of the commission is to request coordination of the triennial review process with management plan updates as part of the comprehensive planning process. The triennial review is a public hearing conducted by the commission to receive information concerning proposed revisions to water quality classifications and standards for state river watersheds.

Table 2 1998 303(d) List in DRCOG Region by Watershed[1]

Watershed	WBID	Name	Portion	Comments	Status	Basis	Parameters
Boulder Creek	COSPBO09	Boulder Cr., So. Boulder Cr. to Coal Cr.	all	Boulder WWTF discharges to segment; NH3 exceedences	PS	Water Quality Data	NH3, Ag Life
	COSPBO10	Boulder Cr., Coal Cr. to St. Vrain Cr.	all	Impacted by upstream NH3 additions; NH3 exceedences	PS	Water Qual Data	NH3, Ag Life
Clear Creek	COSPCL02	Clear Cr, 1-70 bridge at Silver Plume to Argo Tunnel discharge	all	Impacts from historical and present day mining; Cu and Zn exceedences	PS	Water Qual Data	Cu, Zn
	COSPCL05	W Clear Cr, Wood Cr to Clear Cr	all	TM expire 7/1/99; TM and Zn exceedences, mining activity	PS	Temp Mod	Ra226+Ra228, Zn
	COSPCL07	Woods Cr, up Urad Res to W Clear Cr	all	TM expire 7/1/99; temp mods., mining activity	PS	Temp Mod	Ra226+Ra228
	COSPCL11	Clear Cr, Argo Tunnel to Farmers Highline Canal	all	Argo CERCLA site at top of segment; Fe, Mn, and Zn exceedences, CERCLA site	PS	Water Qual Data	Fe, Mn, Zn
	COSPCL13	N Clear Cr and tributaries	all	Impacts from mining (Black Hawk and Central City CERCLA site); Cd, Mn, Zn, Cu exceedences, CERCLA site	PS	Water Qual Data	Cd, Mn, Zn, Cu, Ag Life
	COSPCL14	Clear Cr, Farmers Highline Canal to Youngfield St.	all	TM expire 6/30/00; TM for Cd and Mn	PS	Temp Mod	Cd, Mn
	COSPCL15	Clear Cr, Youngfield St to So Platte R	all	More sampling needed to pinpoint problems, S Platte R TMDL monitoring; Mn exceedences	PS	Water Qual Data	Mn

[1]The following watersheds do not have any listed segments: Big Dry Creek, Bear Creek, Box Elder & Eastern Plains, Chatfield, Cherry Creek

Table 2 Cont. 1998 303(d) List in DRCOG Region by Watershed

Watershed	WBID	Name	Portion	Comments	Status	Basis	Parameters
South Platte Urban	COSPIS14	So Platte R, Bowles to Burlington Ditch	all	TMDLs are currently underway; impacts from urban setting and discharges	PS	Water Qual Data	Mn, NO3, F. Coli,
	COSPUS15	So Platte R, Burlington Ditch to Big Dry Creek	all	TMDLs are currently underway; impacts from urban settings and discharges	PS	Water Qual Data	DO, NO3, Cu, Cd,
	COSPUS16L 1	Mary Lake	all	The F&WS at RMA is currently writing report about Sed. Cont., tissue analysis, and aquatic biology	PS	Fish Cons. Advisory	Hg, Aldrin, Dieldrin
	COSPUS16L 2	Ladora Lake	all	The F&WS at RMA is currently writing report about Sed. Cont., tissue analysis, and aquatic biology	PS	Fish Cons. Advisory	Hg, Aldrin, Dieldrin
	COSPUS16L 3	Lower Derby Lake	all	The F&WS at RMA is currently writing report about Sed. Cont., tissue analysis, and aquatic biology	PS	Fish Cons. Advisory	Hg, Aldrin, Dieldrin
St. Vrain Creek	COSPSV03	St Vrain Cr, Hygiene Rd to S Platte R & Barbour Ponds	all	City of Longmont discharges to this segment; NH3 exceedences	PS	Water Qual Data	NH3, Ag Life
	COSPSV04	Little James & Left Hand Cr	Little James Creek watershed	Mining site assessment by EPA underway-data coming; metals exceedences	NS	Water Qual Data	pH, Cd, Fe, Mn, Zn
Upper South Platte	COSPUS02B	Mosquito Cr, source to Mid Fork So Platte R	all	TM expires 6/30/00; Impacts from historical mining; temp mods.	PS	Temp Mod	Zn
	COSPUS02C	So Mosquito Cr ab Mosquito Cr	below historical mining (London Mine)	TM expire 6/30/00; Impacts from historical mining; temp mods.	NS	Temp Mod	Cd, Fe, Zn, Mn
	COSPUS04	No Fork So Platte R, source to So Platte R	below historical mining (Geneva Creek)	Impacts from historical mining, WQCD monitoring underway	PS	Old Water Qual Data	Al, Cd, Cu, Fe, Pd
	COSPUS05A	Geneva Cr above Scott Gomer Cr	below historical mining (Duck Creek)	Impacts from historical mining, WQCD monitoring underway; Metals exceedences	PS	Data being sent	Metals

Table 3 1998 303(d) Monitoring List: Status of Major Segments in DRCOG Region

Watershed	WBID	Name	Portion	Comments	Basis	Parameters
Chatfield	COSPUS08	E&W Plum Creek on NF Land, exc Bear Creek above Perry Park Reservoir	Plum Creek & Tributaries on National Forest land	Identified by USFS	Assessment	Sediment, Temp
Upper Clear Creek	COSPCL09	Silver Creek below Alice town site to Fall River	Solver Creek	Impacts from mining, Need more data	1988 DOW report	Cu, Fe
South Platte Urban	COSPMSo4	Barr Lake	all	Reports of problems	Water Quality Data	
	COSPUS16	Trib to South Platte River, Chatfield Reservoir to Big Dry Creek	Sand Creek	Need more data	Water Quality Data	Toxicity
Upper South Platte	COSPOS01A	So Platte R, sources to North Fork South Platte River	All[1]	Need more data	1989 NPS Report	Sediment
	COSPUS02A	Tributaries to So Platte R to below Tarryall Creek,	Many segments[1]	Identified by USFS	Assessment	Sediment, Temp
	COSPUS03	Tributaries to So Platte R to below Tarryall Creek to N FK. South Platte R.	Many segments[1]	Identified by USFS	Assessment	Sediment
	COSPUS04	North Fork South Platte River and tributaries to South Platte River	Many segments[1]	Identified by USFS	Assessment	Sediment
	COSPUS06	North Fork South Platte River to Bowles	Many segments[1]	Identified by USFS	Assessment	Sediment, Aq Life

[1]Additional stream segments are listed in the 303(d) List as identified by the United States Forest Service for potential sediment and temperature impairment.

Table 4 Recommendations for the 1998 305(b) Report

Watershed	1996 305(b)			1998 Recommendations 305(b)		
	Segment	**Status**	**Parameter(s)**	**Segment**	**Status**	**Parameter(s)**
Bear Creek	1a. Bear Creek 1b. Bear Creek 1c. Bear Creek Reservoir 4a. Bear Creek tributaries	WQLA WQLA PS PS WQL WQLA PS WQLA	Ammonia Ammonia Metals Ammonia Phosphorus Phosphorus DO Metals, Ammonia	*1a. Bear Creek* *1b. Bear Creek* *1c. Bear Creek* *Reservoir* ~~*4a. Bear Creek*~~ ~~*tributaries*~~	~~*WQLA*~~ */FSA* ~~*WQLA*~~ */FSA* ~~*PS*~~ */PL* ~~*PS*~~ ~~*WQL*~~ */FSA* ~~*WQLA*~~ ~~*PS*~~ */PL* ~~*WQLA*~~	*Ammonia* *Ammonia* *Metals* ~~*Ammonia*~~ *Phosphorus* ~~*Phosphorus*~~ *DO* ~~*Metals, Ammonia*~~
Boulder Creek	9. Boulder Creek 10. Boulder Creek	PS PS	Ammonia Ammonia	*9. Boulder Creek* *10. Boulder Creek*	*PS* *PS*	*Ammonia* *Ammonia*
Box Elder Creek	none					
Chatfield	10a. E. & W. Plum Creek & Plum Creek	WQLA	Ammonia	10a. E. & W. Plum Creek & Plum Creek	~~*WQLA*~~ */FSA*	*Ammonia*
Cherry Creek	1. Cherry Creek 2. Cherry Crk Res 3. Cherry Creek	WQLA WQLA PS WQLA	Ammonia Phosphorus Fecals, Ammonia, DO	*1. Cherry Creek* *2. Cherry Creek Res* *3. Cherry Creek*	~~*WQLA*~~ */FSA* ~~*WQLA*~~ */FSA* ~~*WQLA*~~ */FSA*	*Ammonia* *Phosphorus, Fecals,* *Ammonia, DO*
Eastern Plains	none					
St. Vrain Creek	3. St. Vrain Creek 4. Lefthand Creek	WQLA NS	Ammonia Metals	*3. St. Vrain Creek* ~~*4. Lefthand Creek*~~	~~*WQLA*~~ */FSA* ~~*NS*~~	*Ammonia* ~~*Metals*~~

Table 4 Cont. Recommended Changes to the 305 (b) Report

Watershed	1996 305(b)			1998 Recommendations 305(b)		
	Segment	**Status**	**Parameter(s)**	**Segment**	**Status**	**Parameter(s)**
South Platte Urban	14. S. Platte River 15. S. Platte River 16. L Sand Creek 16L1. Mary Lake 16L2. Ladora Lake 16L3. Derby Lake	WQLA WQLA PS PS PS PS	Ammonia DO, Cd, Cu, Pb, Hg, Se WET Hg, Aldrin, Deildrin Hg,Aldrin,Deildrin Hg,Aldrin,Deildrin	*14. S. Platte River* *15. S. Platte River* 16. Lower Sand Creek 16L1. Mary Lake 16L2. Ladora Lake 16L3. Derby Lake	*~~WQLA~~ /FSA* *~~WQLA~~ /FSA* *~~PS~~* *Monitor* *Monitor* *Monitor*	*Ammonia* *DO, Cd, Cu, Pb, Hg, Se* WET Hg, Aldrin, Dieldrin Hg, Aldrin, Dieldrin Hg,Aldrin,Deildrin
South Platte Urban	14. Clear Crk 15. Clear Crk 17. Ralston Crk	WQLA WQL WQLA	Ammonia Metals	*14. Clear Creek* *15. Clear Creek* *17. Ralston Creek*	*Monitor*	*Ammonia* *Metals*
Upper Clear Creek	2. Clear Crk 3b. Leavenworth Crk 5. West Clear Crk 7. Woods Crk 8. Lion Crk *9. Silver Crk below Alice Townsite* 11. Clear Crk 13. North Clear Crk	PS PS NS NS NS NS NS NS	Metals Metals Metals Metals Metals Cd, Cu, Mn, Zn Cd, Cu, Mn, Zn Cd, Cu, Mn, Zn	*2. Clear Creek* *3b. Leavenworth Creek* *5. West Clear Creek* *7. Woods Creek* *8. Lion Creek* *9. Silver Creek below Alice Townsite* *11. Clear Creek* *13. North Clear Creek and tributaries*	*PS* *~~PS~~* *NS* *NS* *NS* *NS* *NS* *NS*	*Metals* *~~Metals~~* *Metals* *Metals* *Metals* *Metals* *Cd, Cu, Mn, Zn* *Cd, Cu, Mn, Zn*
Upper South Platte	1a. S. Platte River 2a. S. Platte River 2b. Mosquito Creek 2c. S. Mosquito Crk 4. N. Fork S. Platte 5a. Geneva Creek	PS PS NS NS NS NS	Sediment Sediment Cu, Zn, Pb Zn, Cd, Fe Cu, Mn Metals	1a. S. Platte River 2a. S. Platte River *2b. Mosquito Creek* *2c. S. Mosquito Creek* *4. N. Fork S. Platte R.* 5a. Geneva Creek	*Monitor* *Monitor* *NS* *NS* *NS* *Monitor*	Sediment Sediment *Cu, Zn, Pb* *Zn, Cd, Fe* *Cu, Mn* *Metals*

Table 5 Status of Regional TMDLs or Wasteload Allocations

Watershed	Potential Parameters of concern	WLA(s) or TMDL(s) Status
Big Dry Creek	Ammonia, Metals	No TMDLs
Bear Creek	Ammonia, Metals, Phosphorus, DO, Hg	Ammonia —WLA[1] Phosphorus —TMDL[1] Dissolved Oxygen - Reservoir management program
Boulder Creek	Ammonia, Mn, As, Zn, Ag, Cu, Cd, Pb, Hg	Ammonia —WLA[1]
Box Elder Creek	No credible evidence of water quality impairment(s), assume fully supporting - No TMDL(s) required, additional monitoring is needed.	
Chatfield	Mn, Ammonia, Phosphorus	Phosphorus TMDL[1] TMAL for Chatfield Reservoir
Cherry Creek	Ammonia, Phosphorus, Fecals, DO	Phosphorus —TMDL[1] Dissolved Oxygen
Eastern Plains	No credible evidence of water quality impairment(s), assume fully supporting —No TMDL(s) are required, additional monitoring is needed.	
St. Vrain Creek	Ammonia, Mn, Metals	Ammonia - WLA
South Platte Urban	Ammonia, DO, Cd, Cu, Pb, Hg, Se, Ni, Ag, Mn, Zn, Aldrin, Dieldrin, Whole Effluent Toxicity, Phosphorus	Ammonia - WLA, Segment. 14[1] DO - WLA, Segment. 15
Upper Clear Creek	Cd, Mn, Zn, Ra, Cu, Al, As, Ag, Fe, Pb, Hg, Ni, Se, Ti, Cr, U, Ba, Phosphorus, Ammonia	No TMDLs
Upper South Platte	Sediment, Cu, Zn, Pb, Cd, Fe, Mn, Hg, Ag, As, Ammonia, Phosphorus	No TMDLs

[1]Environmental Protection Agency approved wasteload allocation or TMDL.

DRCOG recognizes two processes to request changes to standards or classifications: 1) within a regional context or 2) directly through the Water Quality Control Commission.

TMDL efforts in the 11 watersheds will be in progress over the next 10 to 15 years with local and regional recommendations developed on load allocations for all parameters of concern. Some of these watershed studies could produce recommendations that include changes to standards and classifications. DRCOG recognizes two separate processes to request changes to standards and classifications.

Recommendations for standard or classification changes will be forwarded to the WRMAC for consideration only after they are supported by the appropriate management agency, watershed association or other vested stakeholder group(s). The advisory committee can fully accept, conditionally accept or return these recommendations to the appropriate stakeholder group for further consideration. The advisory committee will submit fully accepted and conditionally accepted standard or classification recommendations to the Board of Directors through the *Metro Vision Plan* process or by special action when necessary. Recommended changes will be submitted to the Water Quality Control Division for review and the Water Quality Control Commission for action after Board acceptance of the recommendations.

The council will testify before the Water Quality Control Commission on proposed standards and classifications as requested by parties to a rulemaking hearing that affect regional water quality management and planning.

The second process for changing standards allows a party to request a separate rulemaking hearing before the commission. When a rulemaking hearing is scheduled, the party requesting the hearing is asked to submit available information to the areawide management agency for the agency's consideration and recommendation prior to the scheduled hearing. In reviewing the request, the council will consider the appropriateness and basis of the request based on a review by the WRMAC. If necessary, final action or policy direction may be provided by the DRCOG Board of Directors.

III. INSTITUTIONAL RESPONSIBILITIES

Maintenance, improvement and restoration of regional water resources in the Denver metropolitan region is an issue of great concern to local governments, special districts, state agencies and federal agencies. This section of the *Clean Water Plan* outlines the institutional responsibilities among these various entities in the water quality management system. DRCOG has approached regional water quality planning and management through regionally linked programs using local management and operating agencies. These must fit within a federal regulatory system primarily administered through the Colorado Water Quality Control Division.

Local management agencies

The regional planning process takes a broad perspective related to facility needs, scheduling, treatment levels, and setting priorities for needed facilities.

Management agencies and associated operating agencies, in addition to being responsible for implementing aspects of the *Clean Water Plan*, decide on the need for and specific characteristics of wastewater treatment processes and the details of implementation within specified parameters.

Management agencies may be individual municipal governments, watershed associations and authorities, general-purpose governments holding an NPDES discharge permit or other special districts responsible for planning and approving permitted facilities. Local governments or affiliated agencies can enter into agreements in order to form watershed associations or authorities with a single management agency designation. DRCOG can fulfill its role as the planning agency through formal memorandum of understanding with these designated watershed associations or authorities. A management agency is defined in the site approval regulations as:

Management agencies

> A*. . . an entity or municipality appropriately designated by the governor or planning agency in accordance with section 208 of the federal Clean Water Act and state law, with responsibilities to implement all or part of an approved water quality management plan.*@

A municipality as defined in state regulations:

> A. . . *means any regional commission, county, metropolitan district offering sanitation service, sanitation district, water and sanitation district, water*

conservancy district, metropolitan sewage disposal district, service authority, city and county, city, town, watershed association or authority, Indian tribe or authorized Indian tribal organization or any two or more of them which are acting jointly in connection with a domestic wastewater treatment works.@

Relationship to planning agency

The relationship between DRCOG as the areawide planning agency and designated management and associated operating agencies provides three primary benefits.

1. Areawide water quality planning ensures an effective regional water quality management system. Since planning considers both point and nonpoint sources, local governments can consider the effects of both sources upon the environment and their water resource systems.

2. Individual facility reports deal with construction, operation, and maintenance of facilities and place the responsibility for developing cost-effective local wastewater management systems on local governments within parameters of the areawide plan development at the regional level.

3. Because of the planning requirements of the Clean Water Act, a local government can be assured that similar activities in adjacent areas are compatible and will not adversely affect activities in their area.

Management agencies can be designated to implement programs related to point sources, nonpoint sources and stormwater.

Management agencies are designated by the governor as recommended by the planning and regulatory agencies. A watershed association approach is used to provide a subregional coordination of management agency actions. As the stormwater permitting regulations require more entities to have stormwater permits, it is expected that the number of active management and operating agencies will change significantly. This will also require a review of these agencies and is likely to result in future changes to the designations and responsibilities of operating and management agencies.

Watershed associations provide subregional coordination.

Authorities

Management agencies designated by the governor to implement the *Metro Vision 2020 Clean Water Plan* have the following authorities:

Management agencies and associated operating agencies decide on the need for and specific characteristics of wastewater treatment.

- Carry out appropriate portions of the *Metro Vision 2020 Clean Water Plan*.

- Effectively manage wastewater treatment works and

related facilities for a designated service area.

- Directly or by contract design and construct new works and to operate and maintain new and existing works.

- Accept and utilize grants, loans and funds from other sources for wastewater treatment management purposes. Management agencies, after designation, are the only agencies authorized to receive federal funds, though other agencies may receive funds through designated agencies.

- Raise revenues, including the assessment of wastewater treatment charges.

- Incur short- and long-term indebtedness.

- Assure implementation of the wastewater treatment management plan, with each participating community paying its proportionate share of treatment costs.

- Refuse wastewater for treatment from any municipality or subdivision thereof which does not comply with any provision of the areawide plan applicable to such area.

- Accept industrial wastewater for treatment and manage pretreatment programs.

Annual reporting responsibilities

All management agencies will prepare an annual report covering the following topics:

Management agencies need to prepare an annual report for the planning agency.

1. A summary of water resources implementation programs, monitoring programs and water quality trend characterizations within the watershed or service area.

2. The status of utility reports, wastewater management strategies, all changes or upgrades to treatment facilities within the year, and any anticipated changes to facility capacity, staging, location, service area, effluent limits and processes for a 10- year period.

3. A summary of development activities within the watershed or service area.

4. Projected five-year capital improvement program, including funding needs.

5. Priority list for funding facilities in the watershed or service area.

6. The ability to implement management strategies and problems being encountered.

7. A summary of other water resources planning activities.

Policy direction

Management agencies work closely with DRCOG on water quality and water resources issues.

Management agencies are expected to work closely with DRCOG on water quality and water resources issues. Agencies proposing to add new or expanded treatment or interceptor capacity must obtain approval from a designated management agency. The addition of new facilities or changes to facilities in the *Clean Water Plan* can be proposed by any management agency. In the event a management agency does not forward or deny the proposed amendment, then the party proposing the amendment may submit it directly to DRCOG for consideration. A proposed *Clean Water Plan* amendment which is not recommended for adoption by the WRMAC can still be forwarded to the DRCOG Board of Directors by a management agency.

Utility plans need to be coordinated with all general-purpose governments served by the facility. The process of accepting utility plans by the WRMAC requires approval by appropriate local governments. The utility plan acceptance process allows designated management agencies to review, comment, coordinate and agree on the most appropriate wastewater management plan for specific service areas.

Operating, collector and interceptor agencies must work through the designated management agency to which they are tributary.

The designated management agency will be responsible for coordination with DRCOG. Collection and interceptor agencies will not be designated management agencies, but will rely upon the treatment agency to which they are tributary for coordination and access to state and federal funds. The collection or interceptor agency must coordinate with its management agency regarding its own or the treatment agency's expansion plans to ensure that treatment and conveyance facilities are synchronized as to capacity and timing.

Designated management agencies are encouraged to coordinate proposed facilities for which they are responsible with recreation agencies, so that recreational opportunities may be provided, where possible, along interceptor rights-of-way and in streams affected by facility infrastructure. Shared funding arrangements should be worked out where necessary to accommodate recreational requirements.

Designation of new management agencies

Additional wastewater management or wastewater operating agencies may be designated when all three of the following conditions are met: completion and acceptance of a utility plan as defined in the *Clean Water Plan*; determination by the DRCOG Board of Directors that a new treatment facility is the best alternative, preferably through the Metro Vision Plan assessment process; and designation of a utility service area consistent with the Metro Vision 2020 process.

These conditions apply whether the area is currently served by a designated management agency or is an unserved area. One alternative that must be considered is if an existing designated management or operating agency can serve this area. An agency which does not itself have treatment capacity, but which has responsibility over the operation of treatment and/or collection/interceptor agencies, may become a designated management agency if it will facilitate implementation and meet water quality goals. Designation of additional stormwater management and/or operating agencies will need to be considered as determinations are made concerning future responsibilities for stormwater management.

De-designation of existing management agencies

Periodically, performances of management agencies will be reviewed to determine if they have been effective in implementing the *Clean Water Plan*. In rare cases, it may be necessary to recommend changes to the structure of management agencies based on new information, recommendations of the watershed association, or on results of watershed water quality studies. The performance review will be conducted as a part of the *Metro Vision Plan* assessment process.

De-designation will normally occur when agencies are consolidated, an agency goes out of the treatment business, or when another agency assumes total responsibility for treatment service. In all permanent de-designation situations, the appropriate management agencies will prepare a recommendation to DRCOG. Action will be taken by DRCOG at the time of the annual *Metro Vision Plan* assessment process and forwarded to the governor for consideration.

Planning agency responsibilities

The *Clean Water Plan* assures that the necessary information for water quality decisions is adequate and up-to-date and that there is proper follow-through.

The role of the areawide plans and the planning agencies is to assure that the necessary information for water quality decisions is adequate and up-to-date and that there is proper follow-through on the part of the management agencies designated in the plans. DRCOG responsibilities as identified in state continuing planning process defined in federal and state statues, include, but are not limited to the following items.

1. Annually review the status of water quality and report on progress in meeting the local, state, and federal water quality goals, which are established in approved plans. Produce a water resources management plan which contains information specifically on total maximum daily load studies and results, effluent limits, municipal and industrial waste treatment, nonpoint source management and

control, residual waste, land disposal, agriculture and silviculture, mining, construction, urban stormwater, implementation measures, dredge and fill, basin plans and groundwater. The *Clean Water Pan* specifically includes population and land use forecasts, wastewater flows, system of facilities, treatment facility characterization, wasteload allocations, water quality characterization, stream modeling, management plans, construction scheduling, funding priorities, and other appropriate wastewater and water quality planning information.

2. Set priorities and identify local needs for improving or constructing wastewater facilities, as required by section 208(d) of the act.

3. Identify the social, economic and environmental costs and benefits of implementing portions of the plan.

4. Provide continuous water quality planning consistent with related areawide development planning efforts for a minimum 20-year planning period.

5. Provide guidance to management agencies in implementing recommendations contained in the *Clean Water Plan*.

6. Document consistency through the *Clean Water Plan* that watershed water quality plans meet the Water Quality Control Division and the Water Quality Control Commission requirements.

7. Monitor and evaluate water quality and other appropriate environmental resource implementation activities and progress of designated management agencies.

8. Produce an annual report on progress toward meeting the goals of the federal Clean Water Act and the State Water Quality Act.

9. Encourage corrective action by management agencies to make adjustments as necessary.

10. Be an active water resources advocate.

11. Evaluate and recommend appropriate management plans related to nonpoint source and stormwater management planning, including periodic review of best management practices and other implementation tools.

12. Provide regional policy development and review.

13. Recommend revisions to water quality standards and stream classifications, where appropriate.

14. Assist designated management agencies with the review of site applications to assure consistency with both approved water quality management plans and policies.

15. Review discharge permits to assure that discharges to a stream segment are treated in accordance with the approved plan, as required by section 208(e) of the act.

16. Review, evaluate, and assist designated management and operating agencies in carrying out their responsibilities established in the approved plan.

Public hearing process

The DRCOG Board of Directors takes final action on the *Clean Water Plan* updates or amendments following a public hearing process in accordance with DRCOG bylaws, which completes the DRCOG approval process. Since the *Clean Water Plan* is closely linked with the State Water Quality Act and the federal Clean Water Act, it must also be approved by the regulatory agencies (Water Quality Control Commission and EPA) before it is officially recognized by those agencies. Approval of the *Clean Water Plan* is necessary before site approvals based on the plan are subject to approval by the Water Quality Control Division.

If the regulatory agencies do not agree with the actions taken by the DRCOG Board of Directors, then the decision of the commission or the EPA is presented to the Board for discussion or reconsideration of the amendment or *Clean Water Plan* update. The Board may accept the commission or the EPA decision or provide an alternative solution. Any alternative solution will then be submitted to the commission or the EPA for reconsideration. This approach keeps the *Clean Water Plan* consistent with the regulatory agencies.

Regulatory agency responsibilities

Local and federal agencies

The watershed protection approach begins at the local level in what is termed as a bottom-up process.

The traditional, clearly defined role of local health departments in the maintenance of safe water will continue. The watershed protection approach advocated by the *Clean Water Plan* begins at the local level in what is termed a bottom-up process. This bottom-up approach assures that local decisions and management strategies will be incorporated in regional plans and recognized in state water resources decision processes. The EPA role is defined in the federal Clean Water Act and its implementing regulations.

Colorado Water Quality Control Commission

The Colorado Water Quality Control Commission adopts and enforces state and federal rules necessary to prevent, control, or abate water pollution.

The Water Quality Control Commission (WQCC), supported by the Water Quality Control Division (WQCD) of the Colorado Department of Public Health and Environment is ultimately responsible for achieving federal water quality goals throughout the state and, as agent for the state, has the following responsibilities.

1. Adopting a comprehensive program for the prevention, control, and abatement of water pollution.

2. Adopting and enforcing state and federal rules necessary to prevent, control, or abate water pollution.

3. Adopting and promulgating water quality standards and classifications for stream segments in the state.

4. Adopting standards for the discharge of wastes in order to attain and maintain water quality standards.

5. Reviewing and approving the location of proposed sewage treatment facilities.

6. Adopting regulations governing the NPDES and Colorado Discharge Permit System through the Water Quality Control Division.

State continuing planning process

The *State Continuing Planning Process,* as contained *Colorado Water Quality Management and Drinking Water Protection Handbook: A Continuing Planning Process* (Commission policy #98-2, June 1998), is the framework for water quality management in the State of Colorado. It sets forth objectives and operational requirements of the state's water quality management program, its organizational structure, intergovernmental decision making process, and timing relationships. The process complies with sections 303(e) and 208 of the federal Water Pollution Control Act and EPA regulation 40 CFR part 130, as well as appropriate provisions of the State of Colorado Water Quality Act. The process defines and clarifies the relationships of the State Water Quality Control commission and division, areawide water quality management planning agencies and the regulated public in making the water quality management process work effectively and efficiently.

Management of water quality is an iterative process.

State and federal water quality laws require that stream standards be reviewed every three years, permits are written for a period of up to five years and water quality management plans

must be updated as frequently as every year. In addition, changing federal and state regulations, new information from water quality monitoring, enforcement actions, special water quality investigations, and decisions to accommodate the construction of new municipal and industrial wastewater treatment facilities must be interjected into the decision making process. This environment of continuing change makes the continuing planning process an essential element of Colorado's water quality management program.

Requirements of update and amendment processes

For the water quality management plans to be useful decision making documents, it is necessary that specific components of these plans be amended periodically. Amendments to the plans must be made in accordance with the federal Clean Water Act and Colorado Water Quality Act. The principal management plan elements that need to be kept current by designated planning agencies through the update and amendment process as defined in the state continuing planning process include, but are not limited to the following items.

1. Facility needs are those capital improvements, purchases, and construction programs for wastewater treatment plants that result in a change in degree or method of treatment or an increase in capacity. These needs, covering a minimum period of five years, must be identified in the management plan and supported by population projections, degree of treatment requirements, and facility timing criteria. New facilities must also be consistent with the service area, location, and capacity identified in the management plan. The plan shall also identify regional priorities for facility construction, improvement, or expansion.

2. The management plan shall locate existing and proposed wastewater treatment facilities. The plan will indicate that stream segment to which the discharge is expected to occur. Stream segments are to be consistent with segments contained in the prevailing state stream classifications.

3. The capacity of a sewage treatment facility is a measure, based upon design criteria and operator proficiency, of the maximum daily wastewater flow and constituent loading which the facility can process while consistently meeting the effluent limitations of the discharged waters. The plan shall identify the allowable organic and/or hydraulic throughput of the plant for existing conditions as well as projected needs.

4. The Colorado Water Quality Control Act requires that management or operating agencies *initiate engineering and financial planning for expansion of the sewage treatment works whenever throughput and treatment reaches 80 percent of design capacity* and *commence construction of such sewage treatment works expansion whenever throughput and treatment reaches 95 percent of design capacity*. The management plan shall identify the existing throughput and treatment, design capacity, and dates that the facility is expected to reach 80-90 percent of design capacity.

5. Population projections are to be based on State of Colorado figures for regional disaggregation. Subregional disaggregation, as adopted by the planning and management agencies, will determine the size of the service area and capacity of new or expanded treatment facilities.

6. The service area for a wastewater treatment facility is that area to which the facility does provide service, is required to provide service, or will provide service when the facility reaches design capacity. It must be consistent with the 20-year service area contained in a adopted local master plan, and shall be consistent with an adopted regional plan where such exists. If neither of these plans has been adopted, the management agency shall be responsible for defining the service area.

7. Prevailing stream classifications and regulations will determine the level of treatment. This will be identified, for existing and proposed facilities, in the management plan.

8. Social, environmental and economic impacts of carrying out the plan include information on the costs and benefits of carrying out the plan in sufficient detail as to be able to identify the costs to individual entities and both the tangible and intangible benefits that will be accrued by the various water users.

9. The major factors in permit conditions for a municipality are determined by the effluent limitations. These limitations are subject to the prevailing stream classifications and standards. Water quality management plans may also identify special permit requirements.

10. The results of a wasteload allocation which has been approved by the Water Quality Control Commission may be assigned to an individual discharger as an effluent limit contained in a state discharge permit. Water quality management plans should assist in determining the need for and completion of wasteload allocation studies by: 1) evaluating stream flow, water quality, existing and projected wastewater discharges to determine the need for such studies; 2) recommending priorities for the conduct of detailed wasteload allocation studies; 3) making suggestions in regard to actual conduct of such studies, including institutional and financial arrangements for carrying out the studies; and 4) recommending the most politically acceptable means for allocating wasteloads among multiple dischargers, where appropriate.

11. Nonpoint source information should be updated as new information becomes available either through wasteload allocation studies, stream sampling projects, or municipal control programs.

12. The designated planning agency is responsible for reviewing and evaluating the performance of each designated management agency within its planning area, and

resubmitting and recommending each management agency at the time of each formal update.

Water Resources Management Advisory Committee responsibilities

Role of advisory committee

The WRMAC is established as an advisory body to DRCOG on matters concerning water resources, including but not necessarily limited to, wastewater collection, treatment and disposal, nonpoint source pollution control, reuse of wastewater, water supply, water quality, urban drainage and management of water pollution. The committee membership includes representatives from management agencies, general-purpose governments and selected industries who assist the council with the maintenance and update of the regional *Clean Water Plan*. The committee serves as a regional advisory group for watershed TMDL programs.

Membership

One representative of each municipality or county holding membership in DRCOG, and an alternate; one representative of each special district, other discharger or permittee which financially contributes to DRCOG's water quality management planning program, and an alternate; one representative of the Urban Drainage and Flood Control District.

Voting

Each member is entitled to a single vote and action must be approved by a majority of those voting.

Functions

The principal responsibility of the WRMAC is to advise the Board on matters relating to water resources, including but not limited to the following:

- Review and comment on proposed projects which will have an impact on the water quality or stream standards at the regional level.
- Review and prepare for Board consideration, if necessary, technical economic, social and political feasibility information on the water quality of streams and lakes within the DRCOG region.
- Assist the council staff in the preparation of planning studies relating to water quality assessment and improvements.
- Assist council staff in coordinating *Clean Water Plan* implementation activities with agencies represented on the committee.

- Review and comment on the areawide water quality management plan, based on work done by the management agencies and the water quality watershed associations or authorities.

- Review and comment on the *Clean Water Plan*, to ensure that water supply and wastewater treatment is coordinated in terms of water rights, conservation, and recycling and reuse or successive use.

- Review regional development plans, including regional population projections, subarea allocations to urban service areas, the adopted Metro Vision Plan, the *Clean Water Plan*, and other appropriate DRCOG regional plans.

- Summarize continuing planning studies undertaken as part of the water quality planning process.

- Summarize program activities undertaken by designated water quality management agencies.

- Provide an assessment of progress made toward implementation of the *Clean Water Plan* including a description of problems or delays encountered.

- Summarize regional water quality facility capital improvement programs for the next five years.

- Provide priority listing of projects recommended for future funding.

- Review proposals by management agencies for the addition of new facilities in the *Clean Water Plan* (If the WRMAC rejects a proposed facility, it can only be forwarded to the DRCOG Board by a majority vote of the watershed association or management agency).

- Develop an annual work program and financial package for ongoing DRCOG water quality management planning.

- Review and advise the Board, as appropriate, on the planning, development, operation, and regulation of storm drainage and flood control facilities, including channeling, temporary ponding, or storage dams and reservoirs, and other structural controls.

- Advise the Board on best management practices and non-structural measures intended to reduce, enhance or manage urban runoff.

- Ascertain the effects of local, regional, state, federal, and other agencies storm drainage and flood control laws, regulations, plans, policies, and procedures and to advise the Board on the appropriate responses to those agencies on these matters.

- Review and prepare comments on storm drainage and flood control projects proposed by local, regional, state, or federal agencies.

- Review existing and proposed planning, development, operation, and regulation of water supply facilities, including diversions, conveyance, storage, treatment, and distribution. Advise the Board on findings, as appropriate.

- Advise the Board as appropriate, on the technical, economic, social and political feasibility of water conservation and recycling, weather modification, reuse or successive use proposals.

- Ascertain the effects on Denver area water supply of local, regional, state and federal water-related laws, regulations, plans, policies and proposals and advise the Board on the implications of and appropriate responses to local, regional, state and federal agencies on those matters.

- Review and prepare, for Board consideration, as appropriate, comments on water projects proposed by state, federal, or other agencies, wherever located, which could beneficially or adversely affect the water supply of the metropolitan Denver area.

Total Maximum Daily Load Steering Committee

Based on recommendations by the Water Quality Control Division and the EPA as regulatory agencies, the WRMAC should consider establishing a steering committee to coordinate regional total maximum daily load studies within the 11 designated watersheds. The principal responsibility of the steering committee should be to advise WRMAC and DRCOG on matters relating to watershed total maximum daily load programs. The steering committee will have a maximum of 25 representatives selected from the WRMAC membership and proportionately representing the participating watersheds. WRMAC will hold elections each January to appoint steering committee members.

Provides greater opportunities for involvement from local stakeholders and the public.

IV. PLANNING POLICIES, PRINCIPLES AND GUIDELINES

Policy statements, planning principles and recommended guidelines

Certain planning functions and water resources issues require a policy statement or recommended guidance to provide a common, consistent basis for decision making. Roles, functions and regulations are continually changing which requires that the *Clean Water Plan* respond to new directions in water quality planning. The *Clean Water Plan* should not be viewed as a static, all-encompassing statement but rather, a flexible document which provides policy direction and summarizes special studies. The following chapter provides accepted planning policies, planning principles and recommended guidance for water quality management and implementation.

Total maximum daily load process

The Federal Clean Water Act requires watersheds with water quality problems to use a *total maximum daily load* process to establish load limits.

Section 303(d) (1) of the federal Clean Water Act requires all watersheds which have significant point and nonpoint source discharges and associated water quality problems to use a *total maximum daily load* (TMDL) process in establishing load limits (Table 6). Generally in Colorado, load limits developed through a TMDL process have resulted in point source permit limits. Permits issued under the National Permit Discharge Elimination System (NPDES) are administered by the Colorado Department of Public Health and Environment through the Water Quality Control Division.

A TMDL process is a mechanism to allocate pollutant loads among sources in such a manner so as not to exceed the water quality standards for a given water body. Ideally this makes TMDLs a tool for attaining state water quality standards, integrating point and nonpoint loads, setting priorities and targets, and facilitating cost-effective solutions.

The basic TMDL formula can be expressed as:

$$TMDL = WLA + LA + MOS$$

However, this formula is an oversimplification of the definition when the various types of hydrology and runoff events are incorporated as elements. Stormwater runoff in larger cities is now permitted under the NPDES program, which makes this runoff a component of the wasteload allocation (WLA). Urban runoff can occur under wet

weather and dry weather conditions. Dry weather runoff from a pipe can easily be treated as a point source and incorporated into the WLA process.

Table 6 Total Maximum Daily Load Definitions

Term	Abbreviation	Definition
Load Capacity	LC	Max. amount of pollutant loading a water body can receive without exceeding water quality standards
Wasteload Allocation	WLA	The portion of loading capacity attributed to point sources and piped stormwater (permitted wet weather stormwater runoff and dry weather flows)
Natural Background	NBG	The portion of loading capacity attributed to natural background conditions, which is generally a component of the LA
Load Allocation	LA	The portion of loading capacity attributed to nonpoint sources
Margin of Safety	MOS	The portion of loading capacity attributed to uncertainty
Total Maximum Daily Load	TMDL	The sum of the WLAs, LAs, NBG and the MOS

Wet weather runoff from storm event is much more difficult to incorporate into the WLA process, partly due to hydrology. Wet weather events are generally associated with higher flows in receiving waters, where the typical WLA is processed for low flow conditions. The load allocation (LA) portion is typically associated with higher flows under wet weather conditions. The LA portion of the formulas includes natural background concentrations, which can be determined separately from the nonpoint source loads. The natural background (NGB) can be a more constant value with some increases under spring runoff or higher flow conditions.

Recommended TMDL screening formulas

Based on these considerations, the following formulas should be considered in the TMDL screening process:

TMDL (dry weather) = WLA (piped dry weather runoff & point sources) + NBG (low flow) + Margin of Safety (MOS)

TMDL (wet weather) = WLA (unit area stormwater & point sources) + LA (unit area) + NBG (high flow) + MOS

Based on the federal Clean Water Act and Colorado state statute, TMDLs must be included in water quality management plans. Required TMDL elements include setting priorities for point source wasteload allocations (WLAs) or nonpoint source load allocations (LAs), allocating WLAs and LAs for stream segments requiring allocations,

long-term water quality monitoring, modeling, data analysis, calculation methods, and listing pollutants to be regulated.

TMDLs for pollutant parameters of concern or as identified in the Colorado Water Quality Control Division's 305(b) report (WQCD 1998) or 303(d) (WQCD 1998) list are a required component of watershed management programs, where there are water quality limited stream segments. Two major issues for watershed managers are determining when and how to proceed with a TMDL process, which results in an approvable TMDL and distinguishing between pollutant parameters of concern and those which do not require either a point source wasteload allocation or a nonpoint source load allocation.

Regulatory TMDL requirements

Listing of approved TMDLS or recommended allocations is a component of management plans.

One of the elements required in the *Continuing Planning Process* (Commission policy #98-2, June 1998) for inclusion in water quality management plans is the completion of TMDL studies within problem watersheds. The plans are required to provide appropriate recommendations on permit limits for significant load sources. Watersheds with stream segments not meeting beneficial uses or have key pollutants projected to be a potential threat to uses will need some type of TMDL analysis for the constituents of concern. It is possible that a TMDL analysis may only be needed for a very localized section of a stream or watershed (i.e., one problematic drainageway within the watershed).

TMDLs and individual water quality-based effluent limits must be included in water quality management plans in accordance with sections 303(d) and 303(e)(3)(C) of the act and section 130.7 of CFR 40. The required TMDL elements include setting priorities for wasteload allocations and load allocations, establishing loads for segments requiring allocations, including water quality monitoring, modeling, data analysis, calculation methods, and list of pollutants to be regulated.

Regional TMDL process

A large number of stream segments in the DRCOG region have varying degrees of impairment based on beneficial use limitations as listed in the Colorado 305(b) report and the 303(d) list. Based on the locations of these impaired or water quality limited stream segments, all 11 watersheds in the DRCOG region have the potential to undergo some type of a TMDL analysis. The amount and type of TMDL analysis effort needed for each watershed will be based on measurable water quality impacts.

All 11 DRCOG watersheds are subjected to TMDL screening.

A watershed with no (or limited) existing measurable water quality degradation will need a minimal TMDL analysis. The Plains watersheds will require this type of minimal

process due to the lack of a significant identifiable problem based on the available water quality or other environmental data. The lack of data does not exclude a watershed from a screening level TMDL assessment.

Most watersheds in the DRCOG region will require more extensive programs that will lead to some type of ongoing maintenance or restoration program to achieve the local and regional goals. The South Platte Urban Watershed has a complex set of water quality issues related to point sources, nonpoint sources and stormwater runoff. Some type of a screening process is needed for these complex watersheds to define workable phases.

The TMDL process can be both expensive and time consuming.

In the DRCOG region, most of the watershed level TMDL processes will involve a large number of stakeholders, require complex institutional arrangements and creative financing. Local funding will be required to complete these TMDL efforts. Therefore, a screening process is recommended which determines the level of TMDL analysis (ranging from minimal screening and no immediate actions to a full linked TMDL process), the type of analysis, constituents of concern and the resource requirements from both a financial and personnel perspective.

As part of the regional planning process, all watersheds will be subjected to an initial TMDL screening process. This process will be used to identify potential parameters of concern, while characterizing existing water quality data. The steps for a watershed level TMDL screening program include institutional, data collection, data evaluation and modeling, allocation of loads and implementation. The two primary steps involved in the screening process are data collection and data evaluation. The TMDL screening program does not set TMDL limits, but rather provides a tool to evaluate data prior to a required TMDL process.

All water quality and other potential useful environmental data including point source, stormwater and nonpoint source runoff along with receiving water data should be compiled by watersheds. This data will be screened to determine the relationship between receiving water quality and state standards. Since Colorado water quality standards are based on acute and chronic conditions, evaluations will focus on both acute and chronic standards.

TMDL screens review point source, nonpoint source and stormwater data, but do not set TMDL limits.

Data evaluation can range from a trend assessment to simple predictive modeling. Generally available models used in TMDL evaluations are shown in Table 7. Screening results can then be used to frame the institutional structure and mechanisms, characterize the data collection needs, predict the level of appropriate modeling activity and define the basic timing elements for a watershed level TMDL process. Screening results can also determine which watersheds are minimal and do not need any more activity in the foreseeable future.

A determination on the utility of an initial screening TMDL analysis will use the best professional judgment of the major stakeholders, including the regulatory agencies. An assumption used in the screening process development was that, at a minimum, a reviewer at the Colorado Water Quality Control Division will be involved in the decision to accept or reject the *initial* screening TMDL analysis results.

Major stakeholders and the regulatory agencies use best professional judgment to determine the validity of screening studies.

The more buy-in from major stakeholders at the onset of a watershed-level screening TMDL process should result in implementation of the most cost-effective and efficient program. The decision by reviewers on the utility of an *initial* screening TMDL analysis will consider:

1. Recommendations of stakeholders involved in the *initial* TMDL screening.

2. The position and recommendations of any formal watershed group, association or management agency responsible for water quality planning and implementation in the watershed or associated with a specific stream segment.

3. Any public comments submitted during an appropriate public hearing process.

Utility of an *initial* TMDL screening

4. The type, quality and availability of water quality or other environmental monitoring data (consultation should be made with entities familiar with the monitoring and sampling procedures, as necessary).

5. The extent or sufficiency of the available monitoring information.

6. The need for additional and/or special monitoring.

7. Verification of a water quality problem based on the data evaluation.

8. The constituents of concern as related to acute and chronic water quality standards.

Predictive models used in a TMDL process can be applied to the entire watershed or focused only on selected receiving waters within the watershed. Models that link the WLA and LA components are more complex and require a much greater effort compared with independent modeling. Watershed level models that use land use distributions and potential concentrations of constituents of concern generated from event mean concentrations from representative storm events are used to develop load allocations.

Table 7 Some of the Available Water Quality Models

Category	Model	Model Description	General Model Application
Biological	FGETS - version 2.00	Food/Gill exchange of toxic substances	Exposure modeling
Reservoir	BATHTUB	Three dimensional empirical model	
	BETTER -Box Exchange Transport Model	2-D reservoir water quality	Models transport, temp, ecological and reservoir parameters
	CE-QUAL-R1	1-Dimensional mechanistic model w/ sediment Interaction	
	CE-QUAL-W1	1-Dimensional mechanistic model w/ sediment Interaction	
	CHATSPREAD - version 1.31	Chatfield reservoir model	EXCEL model developed by Lockheed Marietta
	HSPF9	EPA flow balance model	
Risk	EXAMS - version 2.94	Exposure analysis modeling system	Evaluation of organic compounds, rivers, streams, estuaries
Stormwater	STORM	Stormwater runoff simulation	Continuous simulation to predict loads and pollutant build-up
	SWMM	Stormwater runoff simulation	Storm event watershed model for system hydraulics
Stream	AQUAL2 -version 3.0	Interactive Data Preprocessor	Establishing QUAL2e data sets
	CAM - Colorado Ammonia Model - v 2.01	Stream ammonia wasteload	Colorado stream ammonia wasteload allocations
	DFLOW - version 2.0	Stream flows	Determines acute and chronic flow conditions in Colorado
	MINTEQA2 - version 2.01	Metal speciation equilibrium model-surface/ground	Exposure modeling
	PRODEFA2 - version 2.01	Problem definition program for MINTEQA2	Exposure Modeling
	QUAL2EU - version 3.0	Stream water quality with uncertainty analysis	Steady state modeling in streams and well mixed lakes
	SARAH - version 1.0	Surface water assessment model	Back calculates allowable hazardous waste concentrations
	SMPTOX3	Pollutant concentration along stream	Predicts metals and organic toxicants from multiple sources
	STREAMDO IV - EPA	Stream Water Quality	EPA dissolved oxygen model
	WASP/DYNHYD - version 4.13	Water quality analysis-fate and transport	Fate & transport of chemical constituents in surface water
	WASP4/TOXI/EUTROMOD/DYNHYD4	Water quality in reservoir and stream applications	Fate, transport, toxics, eutrophication in lakes/streams
	WLANH3 - EPA	Wasteload ammonia stream model	General ammonia behavior in stream EPA Region VIII
Wastewater	CAPDET	Wastewater facility planning	Designs wastewater treatment facilities
	POTW - expert version 1.0	Wastewater facility planning	Wastewater treatment facility planning and design
	WMM - version 3.30	Watershed management model	Predicts watershed loadings from urban runoff by land-uses

Receiving water models tend to focus on point source loads and tributary inflows to generate WLAs. From a permitting perspective, low-flow conditions are the most critical in setting permit limits for point sources. As a result, linking watershed models representing high-flow conditions with receiving water modeling requiring low-flow conditions may not be necessary in the development of TMDLs.

The watershed level and receiving water analyses should be kept separate during the initial screening TMDL process.

Linked models should be considered only after the screening phase during a full TMDL process. Monitoring information obtained in the screening process should be divided to represent a high-flow and a low-flow time period. Although all data should be assembled, the screening TMDL process should only require two representative water quality data sets. Data sets should contain water quality data characterizing nonpoint and stormwater events and point sources discharges for each flow period.

The decision tree illustrated in Figure 5 characterizes the necessary steps which should be followed in screening watersheds for TMDL studies. A stakeholder workgroup will be involved in the screening level analyses as depicted in the decision tree. It is important to remember that the data screening and evaluation processes are focused on water chemistry data.

Recommended screening guidance forms the basis for regional evaluations and may not be reflected in final TMDLs.

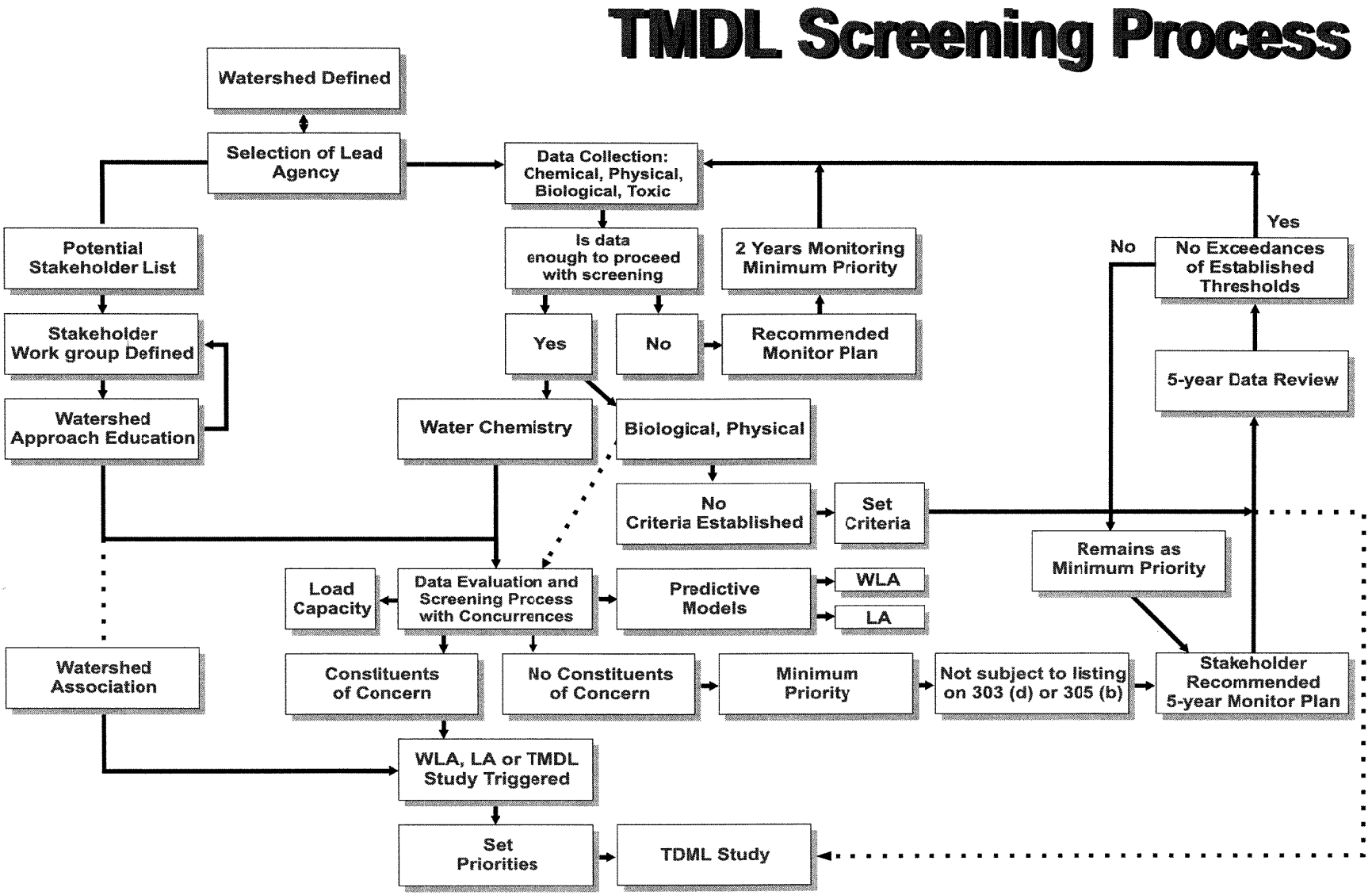
The recommended criteria may not be appropriate for certain biological data and physical characteristics (e.g., sedimentation, habitat and biodiversity). Additional data collection is needed throughout Colorado to develop a database which could be used to establish screening criteria related to whole effluent toxicity, sedimentation, instream habitat and biodiversity. If any of this type of data is available and a TMDL study is warranted from water chemistry data, then the data should be incorporated directly into the TMDL study. Additionally, this type of data should not trigger a TMDL study when the water chemistry data does not warrant a TMDL study.

Point source screening guidance

A *watershed TMDL* analysis for a specific constituent(s) of concern is needed when an acute or chronic stream standard is being exceeded (actual data or modeled data) on more than one stream segment in the watershed at frequencies exceeding the appropriate acute/chronic frequency. A TMDL analysis is triggered if the actual or modeled average level(s) exceed(s) 80 percent of the chronic standard in one or more months of the year (even though the stream standard is not exceeded). A TMDL analysis is also triggered if the acute level is exceeded in more than one stream segment or periodically exceeds 80 percent of the acute standard (even though the stream standard is not exceeded) (Figure 5).

There are three types of point source screens.

Figure 5


TMDL Screening Process
Watershed Defined
Selection of Lead Agency
Data Collection: Chemical, Physical, Biological, Toxic
Potential Stakeholder List
Is data enough to proceed with screening
2 Years Monitoring Minimum Priority
No
Yes
No Exceedances of Established Thresholds
Yes
Stakeholder Work group Defined
Yes
No
Recommended Monitor Plan
5-year Data Review
Watershed Approach Education
Water Chemistry
Biological, Physical
No Criteria Established
Set Criteria
Remains as Minimum Priority
Load Capacity
Data Evaluation and Screening Process with Concurrences
Predictive Models
WLA
LA
Watershed Association
Constituents of Concern
No Constituents of Concern
Minimum Priority
Not subject to listing on 303 (d) or 305 (b)
Stakeholder Recommended 5-year Monitor Plan
WLA, LA or TMDL Study Triggered
Set Priorities
TDML Study

A *stream segment TMDL* analysis for a specific constituent(s) of concern is needed when there is more than one discharger in the stream segment discharging (or likely to discharge) and the specific constituent of concern is at a concentration which could cause the stream to reach a level in excess of 80 percent of the stream standard (actual or modeled).

A *single discharger TMDL* analysis (for a specific constituent(s) of concern) can be used when there is only a single discharge (permitted or should be permitted) to the stream segment which causes or contributes to (or is likely to cause/contribute to) the stream reaching a level in excess of 80 percent the stream standard (actual or modeled). A *single discharger TMDL* study would apply a mass balance calculation at the point of discharge in a manner, which assures stream standards are not exceeded downstream of the discharge. This form of TMDL is acceptable for conservative constituents, but may not be appropriate for constituents which change through biological or chemical action in the stream (e.g., must be modeled).

The 80 percent criteria is used only as a screening criteria.

Additionally, If there are multiple dischargers of the same constituent in the segment, a single discharger approach is appropriate when the single discharger is discharging a concentration multiple times higher than the other dischargers and the other dischargers are discharging concentrations below stream standards (e.g., not relying on any dilution).

A *watershed, stream segment or single discharger TMDL* analysis for a specific constituent(s) of concern is not triggered when the average level (actual or modeled) of the constituent(s) in the watershed or for a specific segment is less than 50 percent of the acute and chronic standards. A watershed, stream segment or single discharger falling into this category should be listed in the water quality management plan as minimal with no need for a watershed level TMDL study in the foreseeable future.

Additional and/or continued watershed water quality monitoring for a specific constituent is needed when the current data and/or model calculations fall within the 50-80 percent of standards range for acute and chronic standards and/or current data is insufficient to reach final conclusions.

Stormwater/nonpoint source screening guidance

The criteria for a watershed level TMDL analysis focusing on stormwater or nonpoint sources cannot be based on the same criteria used to evaluate point sources for developing receiving water chemically-based TMDLs. The hydrology of stormwater produces loadings and constituent impacts that are entirely different from point sources. For this reason, different criteria for assessing wet weather are essential.

Stormwater or nonpoint source screens

Stormwater events in the Denver area are generally of short duration and do not produce a measurable chronic impact in free-flowing receiving waters. Although lakes, reservoirs or other impoundments could have measurable chronic impacts, no data has been collected in the region to support or refute this assumption. Based on current hydrologic understanding, stormwater sources are more appropriately evaluated against acute water quality standards. Since other potential nonpoint source impacts to receiving waters will also be associated with storm events, nonpoint source concentrations should also be evaluated against acute standards.

The acute standards are based on laboratory toxicity tests using exposure periods of 96 hours. Generally storm runoff periods in the Denver area have a duration of less than 24 hours. Exceedences of acute standards during wet weather that occur over relatively short durations have not been shown to cause a toxicity problem and there is no record of fish kills during any wet-weather period. As a result, a storm event time factor that accounts for the duration of exposure by a constituent of concern is critical in the development of realistic evaluation criteria.

Figure 6 illustrates how a time duration and acute standard criteria can be used as a screening criteria. The figure shows a series of storm events over a longer time period. A mean concentration can be measured for parameters of concern during each storm event monitored. Grab samples of equal volume collected from the receiving water during a runoff event at regular time intervals (i.e., say every six hours) will produce a time-weighted-composite mean concentration. The maximum time for individual composite samples should be 24 hours. Runoff longer than 24 hours will require multiple samples to cover the event. This mean value should be evaluated against the acute receiving water standard.

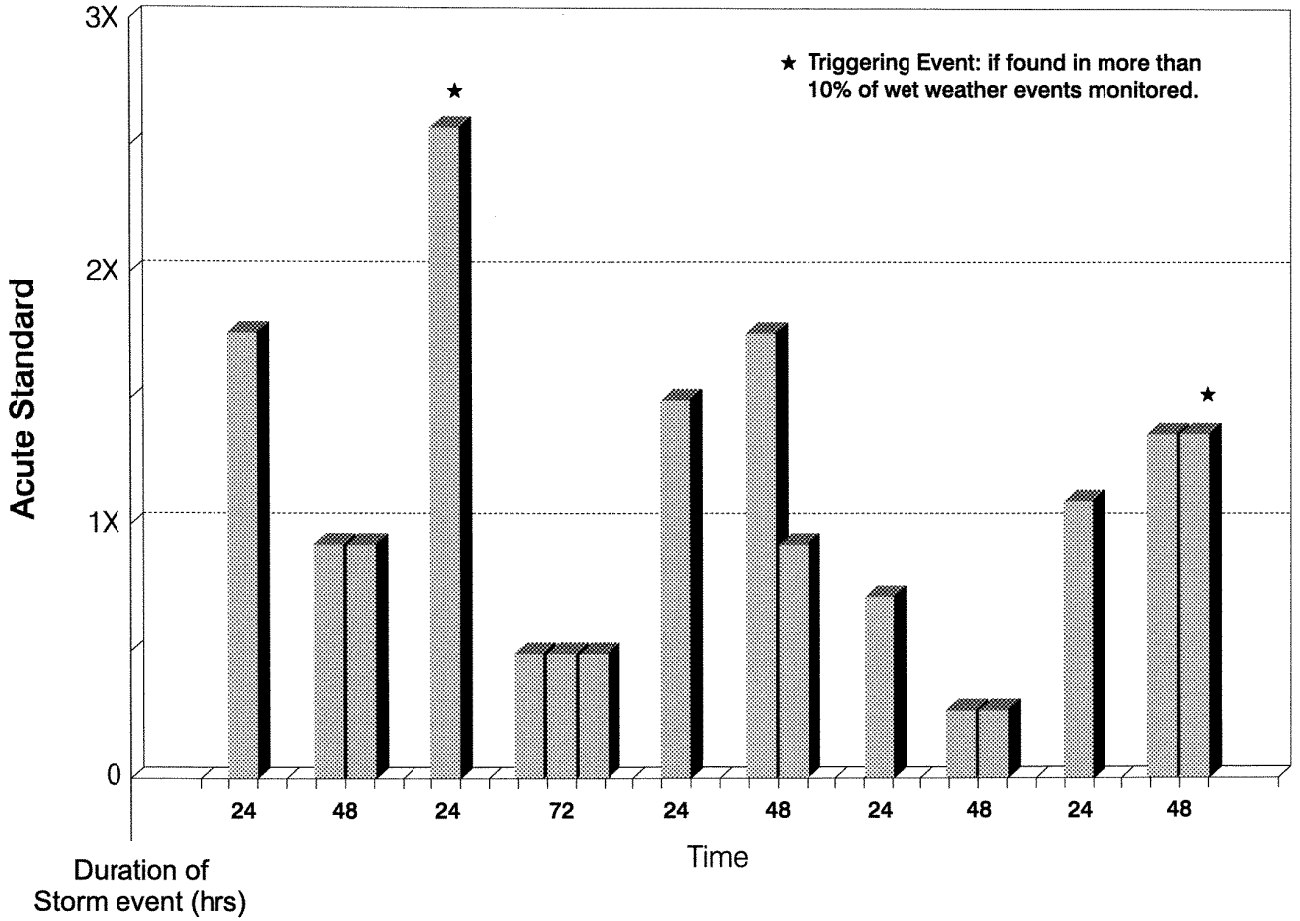
A threshold for determining a potential water quality problem should be based on twice the acute standard (2X) for a storm event of less than 24 hours. This multiplier is used because the acute standard was originally based on one-half of the toxic concentration for the 95th-percentile of most sensitive species exposed to the pure form of the constituent for a period of 96-hours. For runoff events of greater than 24 hours duration, a direct comparison of the mean concentration (1X) should be made against the acute standard.

A single storm event exceeding the threshold criteria should not be sufficient to trigger a full-scale TMDL study. An additional recommended criteria is to monitor multiple storm events and apply a frequency of threshold time exceedence criteria to the total number of storm events monitored as illustrated in Figure 6. The recommended trigger frequency is greater than 10 percent. This is a conservative value as the acute standard is based on a 95th percentile exceedence.

One storm event exceeding either the 2X acute threshold for 24 hours or less, or the 1X acute threshold for 24 hours or greater out of 10 monitored events would not trigger a TMDL study, whereas two events would trigger a study. Assuming a minimum set of

Figure 6

Example Application of Stormwater TMDL Screening Criteria



ten storm events are monitored, then a TMDL study would be triggered if more than one event exceeded the threshold. The number of storm events monitored in the receiving stream of concern is an important factor and this criteria encourages monitoring for more than one year to obtain a minimum set of stormwater or nonpoint data.

Dry weather flows from urban areas could be considered as point sources and the point source criteria based on chronic standards would be appropriate for these types of urban flows. A watershed TMDL screening for stormwater or nonpoint sources should be based on monitoring and not solely on modeling.

General screening considerations

The levels of the constituent being measured in the stream are primarily attributable to one or more permitted dischargers in the stream segment (or from sources which can legally be permitted and should have permits). If the levels in the stream are naturally caused or the result of irreversible (20-year) man-made conditions, then the stream standards should be reviewed to determine if a change in standards is appropriate. If the levels in the stream segment are primarily due to discharges from upstream segments, then a watershed TMDL analysis should be undertaken.

Best professional judgment should be used to determine the appropriate use of outlier data points. Generally, outlier data points should be disregarded in this evaluation unless these data points realistically could be the result of a controlled discharge or a spill or other verifiable event.

The careful evaluation of data credibility is especially important when the standard is near or below the detection level of where there is a limited amount of data. In cases where data reliability is an issue, the dischargers and watershed entity should be given the opportunity to collect additional/better data in a reasonable, but expeditious time frame.

In evaluating data against acute and chronic standards, the reviewer needs to use best professional judgment in making the comparison. Individual data points, which are not deemed to be outliers, are usually comparable to the acute standards. The comparison to chronic standards should consider averaged data and not individual data points. Because of the possibility of insufficient data points to construct monthly averages, the reviewer should consider averaging seasons, averaging multiple years, or other similar averaging approaches.

When using actual acute and chronic data, special care should be paid to low-flow periods in judging whether a problem may exist (e.g., it is not appropriate to average data from high-flow periods with data from low-flow periods or seasons to develop a comparison with chronic values. Where existing stream data is inconclusive, it may be appropriate to gather more data, develop a flow model, or do both.

The 80 percent criteria used in this guidance is intended to be a guide as to when a screening TMDL should be triggered. Where there is a discharger(s) with a reasonably likely potential to exceed standards during an upset condition or to increase the discharge of a constituent by changes in internal processes, then a TMDL may be applicable even though stream data does not show a current need. The 80 percent criteria is not intended to be the TMDL goal (e.g., maximum combined level of discharge), but is only intended to be a trigger level for further action.

Strategy for Achieving Water Quality Beneficial Uses

Strategies focus on watersheds

The goal of the *Clean Water Plan* is to develop strategies and implementation plans, which will result in achieving all beneficial uses within all waters of the region. Over the last few years, interest has increased in Colorado and across the country in a more holistic, integrated approach to environmental and natural resource management. Efforts to take into account the importance of ecological integrity or to consider the development of biological criteria are examples of this trend. These efforts are most logically rooted in a determination of the overall water quality uses and values to be protected or achieved in a particular watershed.

A number of local and regional watershed management and protection efforts have already been initiated in the DRCOG region: Bear Creek Watershed, Upper Clear Creek Watershed, Cherry Creek Watershed, South Platte Urban Watershed (separate segment 6 and 14 and segment 15 efforts) and Chatfield Watershed. Watershed management efforts are expected to occur in the Boulder and St. Vrain watersheds by 1999. Over the last few years the Colorado Water Quality Control Division and the Water Quality Control Commission have shifted toward a watershed focus in the organization of state water quality management program efforts.

Federal water quality program initiatives have an increased emphasis on watershed protection. The EPA is currently encouraging state water quality management efforts to move more in the direction of watershed protection. Moreover, some form of watershed planning and management is likely to be mandated or encouraged by federal Clean Water Act reauthorization.

Federal land management strategy

Federal agencies such as the Forest Service, the Bureau of Land Management and the Fish and Wildlife Service have shifted their efforts toward an ecosystem management approach organized on a watershed basis. For example, the Colorado offices of these federal agencies have recently initiated a Colorado Ecosystem Partnership to coordinate ecosystem planning activities among relevant federal, state and local agencies.

In recent years, concerns have increased in the DRCOG region and in Colorado regarding the appropriate approach for integrating water quantity and water quality management. Watersheds are an appropriate and practical scale on which this integration can occur, particularly when a bottom-up approach (i.e., one that relies on local initiatives and a cooperative approach) to watershed protection is undertaken.

What is a watershed?

The first question to come up in any discussion of watershed protection is: *What is a watershed*? There is no single correct or universally applicable answer to this question. In general, a watershed is a geographic area in which activities may significantly impact a body of water or water segment of concern (e.g. a lake or reservoir, a stream segment or an underlying aquifer, or combinations). Several different factors may be taken into account in defining the geographic scope of a *watershed* that will be the focus of a particular watershed protection effort.

Factors that define watersheds

The first consideration is hydrology. What is the land mass that drains to the body of water or water segment of concern? In other words, within what area will human activities have a physical relationship to surface or groundwater such that the area of concern may be impacted? However, hydrology alone usually will not provide a sufficient answer, particularly when an area of concern is located significantly downstream on a river system. Other factors that may need to be considered are listed below:

Political boundaries - The boundaries of a county, municipality, etc. may need to be factored into the delineation of a particular watershed, e.g. to assure that all or the most important pollutant sources of concern can be addressed, and that jurisdictional disputes can be minimized.

Uses to be protected - The scope, nature, importance and vulnerability of the uses sought to be protected in the watershed may affect the determination of watershed boundaries.

Nature of the problem - The type and scope of existing or likely impacts on the watershed uses sought to be preserved or attained may affect the appropriate geographical extent of a watershed protection effort.

Manageability - A watershed protection effort must have a manageable scope. For example, although all upstream uses could have some theoretical impact on the water quality in the Mississippi River at New Orleans, defining the entire upstream area as a watershed would not result in an efficient or effective watershed protection initiative.

Available resources - The level of resources expected to be available for watershed protection and restoration efforts may need to be taken into account in defining the scope of a particular watershed protection initiative.

In some circumstances, a tiered approach to watershed protection may be necessary. For example, to address a potential eutrophication concern in Chatfield Reservoir, only the area immediately surrounding and upstream of the reservoir needs to be addressed. At the same time, this watershed is one part of a larger area that may be relevant to address watershed protection concerns further downstream on the South Platte River. Different *watersheds* may be addressed by the two separate *tiers* of watershed protection efforts, with different sets of stakeholders depending upon the issue being considered.

A tiered approach to watershed protection may be

A watershed protection approach is an integrated holistic strategy to protect or attain the desired beneficial uses of waters within a watershed, including, where appropriate, protection of human health and aquatic ecosystems. The underlying assumption is that such an approach will be more effective than isolated efforts under existing programs that do not consider the watershed as a whole. A watershed protection approach is not, however, intended as a new centralized program that competes with or replaces existing programs; rather, it provides a framework and new focus for effective integration of ongoing programs. In some instances, it may be appropriate to consider modifications to ongoing programs to better serve watershed goals.

The watershed protection approach does not replace designed areawide planning areas, but rather provides a scale that is more appropriate for some water quality planning

It is generally recognized that nonpoint source runoff from numerous diffuse sources of water pollution can have a significant impact on the protection of beneficial uses or quality of a body of water. Therefore, a watershed protection approach not only addresses the point source discharges to a watershed, but also considers other human activity on surrounding land that may impact the uses and quality of the water resource.

A successful watershed protection approach must be founded on cooperation between the federal, state, and local levels of government, and between the public and private sectors. The state watershed management framework needs to provide substantial and meaningful opportunities on an ongoing basis for input from all sectors of the interested public. Similarly, local or regional watershed initiatives need to emphasize the importance of involving all affected and interested stakeholders in a watershed.

A successful watershed protection approach is founded on cooperation.

Local and regional initiatives involve some combination of watershed planning and watershed management. The relative emphasis on planning versus management will depend on the circumstances at hand. In some situations, the emphasis will be on planning to define a problem and identify actions to be implemented as resources are available. Planning is generally the logical first step to assure that resources are efficiently allocated before going directly to management efforts. In other situations,

however, the nature of the problem and the necessary actions will be more obvious and there will be less need for elaborate planning, with more effort devoted to watershed management.

Although a general watershed protection approach has been used in the DRCOG region for water quality planning and management programs, the process has not always applied an integrated, holistic strategy. The goal of the DRCOG watershed protection approach is to apply an integrated, holistic strategy to protect or attain established beneficial uses of waters within regional watersheds, including protection of human health and aquatic ecosystems.

The first level of watershed designation was based on geographic areas where activities have significantly affected a body of water or stream segment and control programs have been implemented. Different factors then taken into account to define or refine watershed boundaries in the DRCOG region include hydrology, political boundaries, uses to be protected, nature of the problem, manageability, available resources and existing management systems.

11 DRCOG watersheds

Eleven watersheds have been defined: St. Vrain, Boulder, Big Dry Creek, Upper Clear Creek, Bear Creek, Upper South Platte River, Chatfield, Cherry Creek, South Platte Urban, Box Elder and Eastern Plains (Figure 2). The Box Elder and Eastern Plains watersheds have not been well defined due to the extensive area outside the DRCOG region included in these watershed boundaries. A number of political and management issues will need resolution before an integrated, holistic watershed protection approach can be implemented beyond the eight-county DRCOG planning region.

Currently, six municipalities and special districts have service area overlaps between the designated planning areas of the North Front Range Water Quality Planning Association (Association) and DRCOG. These jurisdictions are located within six major hydrologic watersheds, which are shared by the council and association. Two additional hydrologic watersheds are shared in the eastern plains with no existing service area overlaps. The number of overlapping service areas and consequent planning issues are expected to increase.

Planning region overlaps

DRCOG and the association developed a procedure to ensure consistency between the *Clean Water Plan* and the association's 208 plan for current and future overlapping service areas in Adams, Boulder, Larimer and Weld counties. The memorandum of understanding provides a framework for joint participation in certain planning, coordinating, review and management activities to establish consistency between the water quality plans of the parties. Wasteload allocations, water quality modeling and assessments will be done at a watershed planning level. DRCOG and the association agree to exchange and link water quality modeling information as appropriate for water quality assessments in hydrologic watersheds, which overlap between Adams, Boulder, Larimer and Weld counties.

System of wastewater works or facilities

In determining wastewater treatment needs, the primary goal is to provide reasonable, feasible and economical wastewater service to any particular area. Consideration is given to the impact the treatment system will have on receiving waters, the ability to meet water quality standards and the impact a discharger may have on downstream dischargers. The need for a treatment system is based on growth and development, which has been approved by local governments and is consistent with DRCOG's *Metro Vision 2020 Plan*.

The *Clean Water Plan* technical appendices identify the location of all existing and proposed wastewater treatment facilities, and other dischargers within the DRCOG planning region. The stream segments receiving wastewater effluent from facilities are also identified. Stream segments are consistent with segments contained in the prevailing state stream classifications.

Facility classification

All wastewater treatment facilities are listed in the *Clean Water Plan*.

The plan identifies two size classifications for all wastewater treatment facilities (>2000 gallons per day discharge capacity) with an National Permit Discharge Elimination System (NPDES) permit under the Colorado Permit Discharge System (Table 8).

Major facilities are generally limited to major municipal systems which treat 50,000 gallons per day or more of wastewater effluent. Water quality data collected in the DRCOG region suggests that these facilities have the greatest potential to degrade receiving water quality. Major facilities are the responsibility of the appropriate management agency as identified in the technical appendices of the *Clean Water Plan*. Any significant change to planning information for major facilities as approved by the appropriate management agency will require an amendment of the *Clean Water Plan*. The periodic updating of demographic information through the DRCOG planning process can result in the automatic update of major facility planning information.

Minor wastewater treatment facilities with a forecasted average daily flow in the forecast year, established by the DRCOG Board of Directors, of less than 50,000 gallons per day will be identified in the *Clean Water Plan*. Appropriate information will be provided on location, sizing and level of treatment. Minor facilities are subject to regional consistency review and approval by the appropriate management agency. Where new or expanded minor facilities are proposed (total treatment capacity of less than 50,000 gallons per day), consistency with the *Clean Water Plan* may be shown by an accepted utility plan.

Table 8 Size Classification

Size Classification	Size range (gallons per day)
Major wastewater treatment facilities	> 50,000
Minor wastewater treatment facilities	> 2,000 and = to or < 50,000

Location and source area

The service area is that area to which the facility provides wastewater service or will provide service in the future. The service area is usually defined by urbanized areas requiring services by the year 2020 and may be defined by municipal boundaries, legal boundaries of sanitation districts or hydrologic boundaries. The boundaries should be consistent with the adopted extent of urban development in the *Metro Vision 2020 Plan*. Service areas do not overlap. Service areas have a defined boundary and collectively, define urbanized and some non-urbanized areas of the region which require service by 2020.

Each wastewater treatment facility has a designated treatment facility site and a defined service area.

Industrial and commercial facilities

Industrial and commercial dischargers are recognized in the *Clean Water Plan*, since they may have an impact on receiving waters. Currently, 178 industrial and commercial dischargers in the region have NPDES permits. Since all industrial dischargers affect receiving water quality, the *Clean Water Plan* recommends that effluent limits incorporate best available technology (BAT) as defined in the act. Based on a waterbody specific analysis, additional limitations required to meet and attain water quality standards may also be necessary for these discharges. Industrial and commercial facilities must identify a planned service area consistent with facility sizing as an element for inclusion in the *Clean Water Plan*.

178 industrial and commercial dischargers in the region

Wastewater reuse

Support wastewater reuse

The *Clean Water Plan* supports the concept of wastewater reuse for non-potable uses, future potable use, or as a method for additional pollutant removal, as appropriate. It can also be used in some situations to fulfill water rights and augmentation plans. Reuse is an

efficient means of preserving water resources in areas where those resources need to be protected. Reuse of wastewater for water rights or augmentation purposes should be carefully reviewed in relation to downstream water supplies as related to potential health hazards and environmental risks. The quantity and quality of wastewater for reuse should be determined during the planning process.

Consolidation of facilities

Consolidation of wastewater treatment facilities is encouraged, where appropriate.

The *Clean Water Plan* and wastewater utility planning can identify opportunities for facility consolidation. Often, larger wastewater treatment facilities can provide service more effectively while providing a higher degree of treatment than can be achieved through smaller treatment facilities. While large facilities do not always provide better water quality treatment, consolidation of facilities can eliminate smaller treatment facilities which may not be financially capable of operating properly and may be exceeding their discharge permits. The decision for facility consolidation is determined in the utility planning process and is based on economics, cost effectiveness, operations, water quality impacts, physical constraints and water rights.

Wastewater management planning processes

Service areas

Two types of wastewater management service areas are identified: *Wastewater Utility Service Areas* and *CWP Planning Areas*.

The *Clean Water Plan* identifies and maps two types of wastewater management service areas termed *Wastewater Utility Service Areas* (WUSA) and *Planning Areas (CWP Planning Areas)*. Major WUSA are defined as serving over 200 residential equivalents and the permitted wastewater treatment facility has a design capacity greater than 50,000 gallons per day or the facility does not qualify as a minor treatment facility. The overall shape or contiguity of major WUSA (e.g. urban growth area for 2020) is a function of Metro Vision 2020. It is not a function of the *Clean Water Plan* to define the boundaries for the Metro Vision 2020 urban growth boundary.

The *Clean Water Plan* will continue to establish the boundaries between WUSA to assure that there are no overlaps of service areas or planning areas. Mapped variations between the interim Metro Vision 2020 urban growth boundary and the WUSA may occur due to mapping issues and level of detail. It will be a goal of the *Clean Water Plan* to resolve any such discrepancies in the adoption of the next version of the Metro Vision urban growth boundary through the flexibility provisions in the *Metro Vision Plan*.

Minor wastewater facilities and minor WUSA are defined as serving less than 200 or fewer residential equivalents and the permitted wastewater treatment facility has a design capacity of less than 50,001 gallons per day and the facility does not plan to increase its capacity beyond 50,000 gallons per day within the Metro Vision planning horizon (e.g. 2020). Minor WUSA have wastewater treatment facilities with an active discharge permit. Minor facilities or minor WUSA with inactive wastewater facilities or permits will not be shown in the *Clean Water Plan* and they will be treated as new facilities upon a proposal to re-activate. The shape or contiguity of minor WUSA are not required to be defined by the extent of urban development, as an element of *Metro Vision Plan*, where these systems are isolated wastewater treatment facilities which are not contiguous with the extent of urban development. For these systems, defining the current service area and the planning area will be a function of the *Clean Water Plan*. The accepted minor wastewater utility service area may or may not match the property owned by a minor wastewater provider.

For minor facilities and minor WUSA the facility capacity and service area is established based only on the area intended to be served (minor WUSA) at the time the current facility sizing was approved in a site application or discharge permit for the facility. The minor WUSA and facility design capacity are assumed to remain less than 50,001 gallons per day capacity within the Metro Vision planning horizon. If a facility plans an expansion above the 50,000 gallons per day capacity within the Metro Vision planning horizon, then it will be treated as a major facility for the purposes of the *Clean Water Plan* planning and approval process. The minor WUSA and the planning area for the minor treatment facility will be assumed to be equal in area unless amended through the *Clean Water Plan*.

It is assumed that utility plans meeting minimum recommendations contained in the *Clean Water Plan* will be available for WUSA and associated planning areas with a target of January 1, 2003 for completion of all utility plans. It is assumed that utility service area forecasts will be maintained consistent with all Metro Vision 2020 forecasts. Utility plans for minor WUSA may be approved even though they do not have to meet all of minimum recommendations provided sufficient planning is completed to show that there will not be negative water quality effects of any proposed new facility or facility expansion.

Beginning January 1, 1999, *Clean Water Plan* amendments, site approvals and other approvals under the *Clean Water Plan* will require a recognized wastewater utility plan.

Recommended guidance

While defining the extent of urban development is a function of the metro vision planning process, defining the boundaries of specific minor WUSA and defining wastewater utility planning areas are a function of the *Clean Water Plan*. The review and recognition of wastewater utility plans is a responsibility of the WRMAC, subject to a board confirmation process.

Population and employment datasets generated by DRCOG through the 2020 planning horizon will be linked to each wastewater utility service area and to each area designated for interim or permanent non-urban wastewater service. The *Clean Water Plan* will use datasets to predict wastewater flows in 5-year increments through 2020: for major and minor WUSA and for non-urban service areas defined by management agencies at the watershed level.

Wastewater flow projections will be adjusted for future years using available discharge monitoring reports (DMRs), when available. Major and minor utility service area changes made through the flexibility provisions process and included in the *Metro Vision Plan* can be automatically adjusted in the *Clean Water Plan* without a separate amendment process, provided that such change meets:

- the assumptions and recommended guidance for WUSA;
- the assumptions and recommended guidance for CWP planning areas including an approved utility plan for the area;
- water quality management goals established in the *Clean Water Plan*; and
- approval by the management agency.

CWP planning areas are not expected to need urban services until after the year 2020.

Utility plans as outlined in this document and the *Clean Water Plan* are encouraged to use the concept of wastewater *planning areas*. Wastewater planning areas when used out of context from the *Clean Water Plan* will be referenced as *CWP Planning Areas.* Planning areas are either equal to *WUSA* or they are larger. As a result, no planning area can be smaller than a *utility service area*. Planning areas will be based on existing local comprehensive plans, comprehensive long-range utility plans or the area a wastewater provider intends to serve at ultimate development. Planning areas do represent a future urban area that can extend significantly beyond the 2020 planning horizon. They may more closely represent the total amount of urban area needed for a projected 2040 population or the ultimate build-out of a utility service area.

Since WUSA and planning areas recognize different geographies, the density assumptions from *Metro Vision Plan* used for WUSA cannot be applied to planning areas. Planning areas can define interim non-urban areas expected to urbanize after 2020.

The documented process for recognizing CWP planning areas should be established by the Metro Vision Policy Committee based on recommendations from the Water Resources Management Advisory Committee. No amendment to a *utility service area*

which extends beyond a planning area will be recognized in the *Clean Water Plan* until the appropriate wastewater utility plan is amended by the management agency. DRCOG will not assign distributions to planning areas beyond the year 2020.

The *Clean Water Plan* will recognize planning areas through the *Metro Vision Plan Assessment* process. Planning area recommendations must be made by management agencies and presented to the WRMAC for review and recommendation. The initial setting of planning areas is targeted for completion by December 1998. Wastewater planning area designations will be mapped and maintained in the technical appendices to the *Clean Water Plan*.

The *Clean Water Plan* will be updated through the *Metro Vision Plan Assessment process*.

The Water Resources Management Advisory Committee will incorporate a report on accepted planning areas in the Integrated Plan Assessment process. The Water Resources Management Advisory Committee may refer policy conflicts through the *Metro Vision Plan Assessment* process. No separate Board of Directors approval should be required for acceptance of planning area designations, unless a specific request is made by an advisory committee, policy committee or member government for such action.

After the initial setting of wastewater planning areas, a wastewater utility plan (or set of plans) is recommended for each CWP planning area through the *Metro Vision Plan Assessment* process. A transition period will be established which allows existing utility plans to be updated or new utility plans to be created.

Major wastewater provider utility plans should be complete by January 1, 2003.

- A target of January 1, 2003 is established for completion of utility plans.
- Existing facility plans need to be reviewed by the WRMAC for acceptance as interim plans.

A planning area designation amendment must precede an expansion of a utility service area if the proposed utility service area extends beyond the accepted planning area boundary. The WRMAC should recommend a process by October 1998 for the Metro Vision Policy Committee to review.

Overlapping WUSA and overlapping planning areas will *not* be recognized in the regional *Clean Water Plan*. Local resolution of overlap issues is required before there is regional recognition. The WRMAC, watershed associations and council staff may provide appropriate technical assistance to help resolve planning area overlap issues through a utility technical support process established as part of the committee=s annual program. Technical support by DRCOG staff will only be provided on a request basis.

If conflict resolution cannot be achieved on a timely basis, then one or both entities having a conflict can take the issue directly to the Board for recommendation.

Wastewater utility service to non-urban areas, which can include designated open space, permanent non-urban wastewater served developments, agricultural or special use, may not be economically served by centralized service in the *nearterm* requiring other management solutions. Non-urban wastewater planning areas may be designated as permanent non-urbanized areas which are to be permanently served by individual sewage disposal systems. Wastewater planning areas may also be designated as permanent non-service areas (open space, agricultural areas, low density non-urban with no more than one residence or structure per 35 acres).

Designated interim non-urban areas

Interim non-urban areas can also be designated as being expected to eventually urbanize (after 2020) and require centralized services. Wastewater utility plans should address how these interim non-urban areas, within the planning area, will be served and estimate when urban service requirements should be considered. The nonpoint source management agency responsible for non-urban wastewater planning should identify an appropriate method to evaluate water quality effects related to individual sewage disposal system development in *non-urban* wastewater areas.

Relationship to site application process

Planning areas will be used in the site application review process where it is necessary to size facilities such as interceptors based on a planning horizon which extends beyond 2020 to provide cost-effective service. In general, treatment facilities and lift stations should be staged to provide for 10-year capacity increments, but may be staged for longer periods with appropriate economic justification. Interceptors may be staged for ultimate build-out with appropriate economic or right-of-way justification. Wastewater infrastructure designed to wholly serve a planning area will **not** be used in the site approval process or to meet other appropriate regulatory requirements.

Wastewater infrastructure designed to serve WUSA can be located within CWP planning areas that are outside the urban growth boundary. Under this condition, wastewater infrastructure will be recognized as consistent with the *Clean Water Plan*, and so referenced in the site approval process or to meet other appropriate regulatory requirements.

Datasets and forecasts

The foundation of water quality planning is the forecasting of expected wastewater treatment needs, which is tied to future population and employment levels. Forecasts define wastewater flow rates and the capacity needed to treat the projected volume of wastewater. Datasets and forecasts for

The foundation of water quality planning is the forecasting of expected wastewater treatment needs.

utility service areas and planning areas are included in the technical appendices to the *Clean Water Plan*. Population and employment forecasts by selected planning years through 2020 are defined by datasets produced for the *Metro Vision Plan* process.

The unit geographies for the Metro Vision datasets are utility service areas. Associated wastewater flow projections will be generated from the Metro Vision datasets and they will be directly related to utility service areas but not necessarily to planning areas.

Adopted regional subarea population and employment distributions shall be used for all planning activities of DRCOG, and additional distributions will be consistent with the adopted subarea distributions for such geographic areas as may be necessary and appropriate to conduct water quality planning. In the preparation of subarea studies by DRCOG, it shall be appropriate to use alternate subarea distributions in addition to the adopted distributions, in order to evaluate the effects of different growth assumptions. In the conduct of local planning or subarea studies by other entities, the Board of Directors encourages the use of DRCOG's forecast distributions as one of the alternative forecasts considered.

Recommended guidance

The council will generate and maintain population and employment forecasts and wastewater flow estimates for selected planning years (five-year increments) through 2020 for both minor and major WUSA. The council will **not** generate population, employment or wastewater flow datasets for CWP planning areas.

The *Clean Water Plan* may use equivalency processes to convert population and employment data sets to WUSA for selected planning years through 2020 and for use with longer-term potential development within CWP planning areas. Wastewater utility plans can show alternative projections and flows for WUSA that are within 15 percent of the regional projections. Projections that differ by more than 15 percent will not be recognized in the *Clean Water Plan* without additional site-specific justification.

Wastewater utility plans will need to provide their own projections and flows for CWP planning areas or WUSA beyond the year 2020 until the regional horizon is changed. Forecasts for WUSA will be used in the site application process and to meet other appropriate regulatory requirements. As necessary for cost-effective utility service, CWP planning area forecasts may be used to size a wastewater facility (e.g., the size of an interceptor, land area needed for a treatment facility or lift station site), These forecasts will be so referenced in the site application review process or to meet other appropriate regulatory requirements.

Utility plans for wastewater works or facilities

All utility plans will contain a defined set of minimum information and appropriate state or federal requirements.

Utility plans document the wastewater management strategy for a wastewater treatment facility (greater than 2,000 gallons per day capacity) and the associated planning area. All utility plans will contain a defined set of minimum information (location, sizing, staging, service area, process system, effluent quality and financial arrangements) and appropriate state or federal requirements. Utility plans for minor facilities or minor WUSA may be approved even though they do not meet all of the recommended planning elements, provided sufficient planning is completed to show that there will not be negative water effects of any proposed new facility or facility expansion. Utility plans will provide planning documentation for both the designated utility service area and planning area, with the utility service area having the maximum level of information.

The primary goals in establishing wastewater utility plans are to provide reasonable, feasible and economical wastewater service to an area designated for urban development or within the DRCOG watersheds. A utility plan should consider the water quality impact the treatment system will have on receiving waters and provide a strategy for meeting all applicable water quality standards and classifications, while quantifying the potential impact a discharger may have on other dischargers.

All permitted and active wastewater treatment facility management or operating agencies located in the eight-county metropolitan region or located in the watersheds as defined in the *Clean Water Plan* are encouraged to submit a utility plan for review and recommendation through established *Clean Water Plan* processes by Jan. 1, 2003.

Information in a utility plan is used in the *Clean Water Plan* process to document the best method of providing wastewater service while meeting water quality goals through and beyond the planning horizon (2020). Wastewater utility plans can function to define service beyond the 2020 planning horizon. Wastewater utility plans are not applied to water supply or stormwater service areas.

Criteria established in the *Clean Water Plan* will be applied to CWP planning areas, WUSA and reflected in utility plans. At minimum, population and employment projections produced by the *Metro Vision 2020 Plan* will be included with wastewater utility plans. Alternative projections contained in wastewater utility plans that vary significantly from Metro Vision should be justified in the utility plan. Alternate projections contained within the wastewater utility plans may be used to size wastewater infrastructure.

The council will maintain a reference set of accepted utility plans developed by management agencies or operating agencies for all permitted wastewater treatment facilities with an active discharge permit. The siting and expansion of industrial discharges will be identified in the *Clean Water Plan* under special provisions developed by the WRMAC and presented by October 1998 to the Metro Vision Policy Committee for review and action.

Any wasteload allocation or total maximum daily load analysis included in a utility plan will be based on population and employment forecasts and wastewater flow estimates developed through the *Metro Vision 2020 Plan*.

Proposed functions of wastewater utility plans

Specifically, each wastewater utility plan will address the CWP planning area and utility service area for one or more existing or proposed wastewater treatment works. A wastewater utility plan is intended to be a document (or set of documents) which provide basic information for wastewater treatment works to:

- meet the requirements of the site application regulations as adopted by the Colorado Water Quality Control Commission;
- provide sufficient information to form the basis for portions of the regional *Clean Water Plan* related to water quality assessments and wastewater management;
- provide facility information to assist in preparing total maximum daily loads, wasteload allocations and/or other watershed planning efforts;
- provide facility information to assist in preparing *Clean Water Plan* amendments;
- provide facility information to assist in preparing discharge permits; and
- assure that CWP planning areas of adjacent utility plans do not overlap.

Utility plan can consist of multiple documents.

A wastewater utility plan may consist of a number of separate utility reports. These may be prepared by the same agency or a combination of agencies, which provide separate geographical detail and/or facility detail, or separately meet the goals of the wastewater utility plan.

Recommended utility plan acceptance policy

The WRMAC will recommend by October 1998 a *utility plan minimum recommended guidance* and incorporate this guidance as a technical appendix into the *Clean Water Plan* by January 1999. Utility plans will be reviewed by the WRMAC and WRMAC will make one of the following three recommendations:

- recognize or accept the utility plan;
- conditional recognition or acceptance with the conditions listed; or
- refer the utility plan back to the management agency(ies) for additional actions or information.

On an annual basis, the WRMAC will request confirmation of the utility plans from the council's Board of Directors on its recommendations through the Metro Vision Plan assessment process. Recognized and conditionally recognized utility plans will be referenced in the *Clean Water Plan* and these plans will represent the preferred wastewater management strategy for the wastewater utility service area and the CWP planning area. Recognized and conditionally recognized utility plans will be used in the site approval process, as *Clean Water Plan* amendments and to meet other appropriate regulatory requirements. Utility plans may be forwarded at any time to the WRMAC for review and recommendation.

Required minimum components of utility plans

Minimum required information

Infrastructure sizing and staging - Include current capacities and projected future capacities for all treatment plants, lift stations, and interceptors (including a construction schedule based on time or capacity milestones) that are needed to serve the wastewater utility service area. Alternatively or in addition, include those facilities needed to serve the CWP planning area. For facilities that do not need to be constructed until after 15 years in the future, the location, staging, and capacity may be estimated in a general manner and does not require detailed flow projections. The level of accuracy for projected infrastructure capacities listed in utility plans should consider:

- five-year capital improvements (maximum level of detail);
- six to 15 years, planning major projects and estimated capacities;
- 16-25 years, anticipated major expansions; and
- 25 years, concepts only.

Sizing and staging of the wastewater treatment facility are tied to the DRCOG's projections of population and employment. This size, or hydraulic capacity, is based on two factors: the rate of flow (annual average daily) produced by the sewered customers and the staging of construction or expansion. Facilities designed for a 20-year period should be sized or have a design capacity 20 percent greater than the projected flow at the end of the 20-year period. Local population projections used to generate wastewater flow projections should be documented and differences between regional

projections and local projections explained. Table 9 provides some planning factors that can be used to estimate wastewater flows.

Treatment works location and siting - Location of existing and planned wastewater treatment works to serve areas defined within WUSA or located in CWP planning areas. Location of existing and planned lift stations to serve areas defined within WUSA or located in CWP planning areas. Existing facilities and facilities to be built within two years should be shown at a specific location. New facilities planned beyond a two-year time horizon may be shown/mapped at a specific location or may be shown in a general area envelope as long as water quality issues are essentially the same within that envelope. For new wastewater treatment works and new lift stations, an identification needs to be included in the utility plan of flood hazard issues and geological suitability issues related to the proposed site (or site envelope) and the measures to be taken to mitigate any identified problems or risks.

Interceptor - The utility plan must list lines in the system that qualify as interceptors. The definition of an interceptor in the *Regulations for the Site Approval Process* (WQCC regulation #22) is:

Definition of an interceptor

> A*. . . a sewer line will be considered as an interceptor sewer if it has an internal pipe diameter equal to or greater than 24 inches and it meets one or more of the following criteria: (a) it intercepts domestic wastewater from a final point in a collection system and conveys such waste directly to a treatment plant, the interceptor sewer may also collect wastes from a limited numbers (fewer than five connections per mile of sewer) of building services and sewer laterals along its route to the wastewater treatment plant; (b) it serves in place of a treatment plant and transports the collected domestic wastes to an adjoining collection system or interceptor sewer for treatment; (c) it transports the domestic wastes from one or more municipal collection systems to another municipality or to a regional; treatment plant; (d) it intercepts an existing major discharge of raw or inadequately treated wastewater for transport to another interceptor or to a treatment plant."*

Table 9 Factors That Can be Used to Estimate Wastewater Flow

Types of Use	Average Wastewater Flow (gallons/day/person)
General Population And Employment	
Single-Family Equivalence - Regional	85
General Employment - Regional	50
Site Specific Planning Averages	
Stores, Offices, Small Business - Employees	25
Stores, Offices, Small Business - Guests	8
Hotels/Motels - Employees	50
Hotels/Motels - Guests (24-hrs)	20
Cabins - Guests (24-hrs)	50
Dining Facilities (Per seat)	10
Schools (no showers) - day use (8-hrs)	12
Schools (showers) - day use (8-hrs)	25
Tourist/Trailer Camps - Employees	50
Tourist/Trailer Camps - Guests (24-hrs)	85
Recreational Facilities - Employees	50
Recreational Facilities - Guests	20

Mapping qualifying interceptors

The utility plan will contain maps of all qualifying interceptors, including location of existing and planned interceptors to serve areas defined within WUSA or located within CWP planning areas. Colorado's Water Quality Act provides special procedures for review of interceptors. Ninety days prior to the construction of an interceptor line, the responsible entity will notify DRCOG and the WQCD. This notification will include a certification that the treatment facility has the capacity to treat the projected flow from the interceptor. DRCOG is required to certify within 30 days that the interceptor line has the capacity to carry the projected flow. If these certifications can not be provided, the entity must apply for a site application.

The *Clean Water Plan* does not provide flow projections for interceptors. Projections for major lines are developed on a case-by-case basis for use in this certification process. The four steps in the certification process include:

1. Determining consistency of service area with utility service area or planning area.

2. Calculating year 2020 population and flow based on Metro Vision projections. Compare these with interceptor capacity. If capacity is less than projected flows, review with entity responsible for construction. Such review may indicate

differences in assumptions or design parameters. If these items can be resolved, a certification of adequate capacity can be provided.

3. If the interceptor's capacity is significantly greater than year 2020 flows, then the review will be based on design assumptions. If the interceptor is designed for the year 2020, the policy regarding review of growth assumptions will be used. This policy states that if the projected population and/or employment a proposed project is designed to serve is different from DRCOG's allocations by more than 15 percent, a technical justification will be requested.

4. If the interceptor is designed to serve a population projected beyond the year 2020, DRCOG can only certify that the interceptor has adequate capacity to carry flows in the year 2020.

Level of treatment for new and expanding facilities - The utility plan should list the effluent discharge quality necessary to meet receiving water quality classifications and standards, including:

1. a list of projected discharge permit limitations based on state effluent standards, receiving water classifications and established water quality standards;

2. discharge quality necessary to meet any total maximum daily loads or wasteload allocations as listed or recognized in the *Clean Water Plan* for the time horizon identified in the plan; and

3. other effluent limits recommended in the *Clean Water Plan* and/or necessary to meet state requirements.

For all existing treatment facilities, an identification of whether the receiving body of water (or any downstream body of water affected by the discharge) is currently water quality limited for a constituent to be discharged by the facility (or will be water quality limited within a 10-year period). If the discharge quality is/will be controlled by a water quality limited water body, then an identification of the constituent(s) of concern and source identification of water quality limited designation (e.g., 303(d) list, 305(b) report, watershed TMDL effort) and an identification of the allocation (concentration, poundage and/or other alternatives) of the constituent(s) to the treatment plant during the planning horizon. Therefore, the utility plan should contain the following items:

1. For treatment plants that will not be built or expanded for 10 or more years, a general discussion of the constituents to be controlled and the availability of allocations for the body of water is sufficient, and exact concentration or poundage estimates are not necessary unless there is a conflict with an existing total maximum daily load or wasteload allocation (TMDL or WLA).

2. For wastewater treatment plants to be built or expanded within the next 10 years, a recommended treatment technology and treatment plant configuration to meet the

projected discharge permit limitations and a listing of alternative technologies for consideration must be included.

3. For wastewater treatment plants to be built or expanded in a 10 years in the future, a written determination that achieving the projected effluent limitations is technically and economically feasible should be part of the plan.

WUSA and CWP planning areas - Identify WUSA and CWP planning areas by watershed(s) as defined in the *Clean Water Plan*. Maps of the wastewater utility service area and, if desired, the CWP planning area showing the area to be served by a treatment facility (or more than one plant operated as a coordinated system, e.g. satellite plants) should be included. Maps should be detailed enough so that being inside/outside the boundaries can be determined at a block level.

For WUSA and CWP planning areas, identification on a map of the areas to be served by gravity sewers and identification of areas which will be served through one or more major lift stations. The minimal recommended mapping of major lift stations should include those systems that have an average pumping capacity which is 1/5 or greater of the existing average treatment works capacity (for example, a 100,000 gallon per day treatment facility will list all lift stations at or greater than 20,000 gallons per day) or any lift station over 0.5 million gallons per day.

Process system - The utility plan will include a summary of the major system processes and types of treatment for the treatment works including:

1. level of treatment (i.e., secondary, advanced for phosphorus removal, etc.);

2. sizes of system components; and

3. biosolids processing system and method of beneficial reuse or disposal.

Management and financial considerations - Identification of management agency, associated watershed association and operating agency(ies). Identification of management agency agreements or other memorandums of understanding. Identification of special control regulations or other water quality regulations specific to utility service area or CWP planning area. An estimate of capital costs for all new wastewater treatment plants, treatment plant expansions, new lift stations, lift stations expansions, and interceptors which will be built within the next 10 years. An estimate of changes in operating costs and total expenditures necessary to carry out the wastewater system improvements planned within the next 10 years and a discussion of the sources of revenue necessary to meet those expenditures for:

1. new wastewater treatment agencies;

2. any wastewater treatment facility that is in repeated noncompliance with significant permit requirements; and

3. treatment agencies expecting to increase the volume of wastewater treated by more than 100 percent in the following 10 years.

Wastewater treatment agencies relying on projected new sewer customers to provide the revenue sources to build additional facilities need a management plan that:

1. addresses rate and charge structures;

2. remains financially solvent should projected growth not occur;

3. promotes institutional arrangements to guarantee payment of charges from large connectors (over 10 percent of the projected revenue) and from other governmental connectors;

4. identifies any interest in applying for a state revolving loan to finance any infrastructure or improvements;

5. identifies any significant industrial user(s) under pretreatment regulations, arrangements for meeting pretreatment responsibilities; and

6. identifies any industrial or commercial sewer connections with the potential to overload the treatment plant hydraulically or with loadings, a description of the methods for controlling rates of flow to the treatment facility.

Biosolids

The federal Clean Water Act directed the EPA to develop regulations for the use and disposal of sewage sludge. These regulations include disposal siting, uses, procedures for disposal and specific parameter concentrations for disposal or use. The 1987 amendments to the act added a requirement for the EPA to identify the toxic pollutants in sewage sludge that may adversely affect human health or the environment, establish regulatory management practices, and develop numerical limits for each of the pollutants.

A valuable, recyclable, nutrient-rich resource called *biosolids*.

The *Clean Water Plan* estimates more than 115 wastewater treatment facilities will be operational by 2015 in the eight-county DRCOG region. Over the past 20 years, these wastewater operating agencies have been helping to improve water quality by producing ever-cleaner effluent prior to discharge. One result of this increasingly cleaner effluent is more solids are being removed from the wastewater flow during the treatment process. This treatment byproduct is a natural, organic material formerly known as sewage sludge. This mostly organic residual solid material, when treated in compliance with strict

Colorado and federal regulations, becomes a valuable, recyclable, nutrient-rich resource called *biosolids*.

Colorado's biosolids regulations (Colorado Department of Public Health and Environment Biosolids Regulation 4.9.0) define biosolids as the accumulated residual product resulting from a domestic wastewater treatment works. Biosolids do not include grit or screening from a wastewater treatment works, grease, commercial or industrial sludge, or domestic or industrial septage.

Programs for controlling industrial wastes, called industrial pretreatment programs, are in place for larger treatment facilities (greater than five million gallons per day) and for smaller facilities with significant industrial flows in the council region. The U.S. EPA and the Colorado Department of Public Health and Environment provide industrial pretreatment oversight for areas served by smaller facilities. These industrial pretreatment programs reduce discharges of pollutants from commercial and industrial sources to municipal sewer systems. The effectiveness of these programs and a low density of *wet* (potentially polluting) industries in many parts of the eight-county region are the major reasons wastewater treatment facilities can produce biosolids that meet the strict metals content restrictions in the Colorado and federal regulations.

Biosolids produced by local wastewater operating agencies are applied to crop and pasture land within our region and on lands in adjacent counties. Since some of the biosolids originated as food products from these farms, returning them to the land as environmentally safe soil amendments completes a natural cycle. Over 85 percent of the biosolids produced in Colorado were being recycled by the early 1990s. Sixty percent are applied as soil amendments to agricultural land used to grow corn and dryland wheat as well as to pastures and rangeland. An additional 20 percent are applied to land reclamation sites, and five percent are sold to nurseries, commercial landscapers, and other users. The remaining 15 percent are disposed of by other means and are not recycled.

Biosolids contain significant amounts of nutrients such as nitrogen, phosphorus, and potassium. Biosolids are, in effect, a slow-release nitrogen fertilizer with low concentrations of plant nutrients. Additionally, biosolids contain essential micronutrients such as zinc and iron. Many of Colorado's soils are deficient in these micronutrients. Biosolids are rich in organic matter that can improve soil quality by improving water-holding capacity, structure development, and air and water transport. Proper use of biosolids can ultimately decrease topsoil erosion, especially in eastern Colorado.

When applied at agronomic rates (the rates at which plants require the nitrogen during a defined growth period), biosolids provide an economic benefit in addition to their environmental benefit. Colorado State University agronomists have been conducting controlled biosolid application studies for the last 11 years which have shown continuous application of three dry tons of biosolids per acre every other year to dryland winter wheat

generally produces comparable yields, larger protein contents, and larger economic returns compared with use of 50-60 pounds per acre of commercial nitrogen fertilizer.

Biosolids application has not produced a measurable threat to groundwater supplies when applied as specified in regulations and recommendations of recognized soil scientists such as those at Colorado State University. The potential for nitrate contamination under non-irrigated or dryland cropping conditions (e.g., such as conditions found in much of eastern Colorado) appears to be negligible when biosolids are applied at agronomic rates. Based on soil-test information, groundwater contamination is also unlikely under irrigated conditions within shallow water tables. In fact, the potential for nitrate contamination of groundwater from many conventional farming practices appears to be greater than from correct application of biosolids.

Decades of scientific research have shown that biosolids are safe for use around people and animals. This research has been conducted by local scientists at Colorado State University, the University of Colorado, the Colorado Department of Public Health and Environment, EPA Region VIII, and member government wastewater operating agencies, as well as at reputable national institutions. Extensive data, collected since the 1920s, demonstrate that biosolids used in compliance with Colorado's regulations have not posed a measurable threat to either human health or the environment. No documented cases of illness or environmental harm exist when biosolids were used properly.

Although there are other legal means of disposing of biosolids (such as incineration and land filling) neither method benefits Colorado as does recycling. Burning biosolids consumes huge amounts of energy and pollutes the air, while burying them takes up valuable space in local landfills. Recycling biosolids is clearly the preferred method for disposal.

DRCOG recognizes and supports the economic and environmental benefits of recycling biosolids.

DRCOG recognizes and supports the economic and environmental benefits of recycling biosolids, and appropriate council policy documents will recognize the value of biosolids recycling. The council's biosolid positions are as follows:

1. Public health and environmental quality are protected under federal and state biosolids regulations. The council encourages member governments not to adopt local public health regulations for biosolids that are more stringent or restrictive than federal or state regulations.

2. The council encourages the practical and beneficial land application of biosolids in the DRCOG region. Member governments with land use authority should regulate biosolids disposal through the zoning and platting process. Local regulations should focus on transportation, aesthetics and land use issues.

3. The council does not support any biosolids disposal practice which does not attempt to beneficially reuse this valuable resource.

The biosolids policy will be used by the council's staff in the site approval process as defined in the *Clean Water Plan*. The state revolving loan program point system should be modified to give bonus points for wastewater treatment facilities using or planning to use biosolids reuse. The council will work with the Water Quality Control Division of the Colorado Department of Public Health and Environment to make this change in the state revolving loan program regulation.

The council will assist small dischargers within our region by providing an education and training program. Additionally, a general education and training program based on existing materials and information will be developed and made available to all member governments. Educational materials developed by Colorado State University, the University of Colorado, the Colorado Department of Public Health and Environment, EPA Region VIII, the Water Environment Federation and member government wastewater operating agencies will be used in the education and training program.

The council, in cooperation with a subcommittee of the WRMAC, will explore a regional cooperative program among member governments in the form of a demonstration project. Potentially, a joint-use land application site would be selected for demonstrating the beneficial reuse of biosolids. This site would utilize biosolids provided by multiple wastewater operating agencies. This demonstration site would be used in conjunction with the general education and training programs.

The council will explore the possibility of incorporating other organic materials such as yard wastes (grass clippings, leaves and tree trimmings) into bio-solid recycling efforts. This effort will be coordinated with the council's solid waste management activities.

Pretreatment program

Some industries discharging pollutants must pretreat their wastewater before discharging into municipal sewers.

The National Pretreatment Program was created by the U.S. Congress in 1972 to protect the nation's wastewater treatment facilities and waterways from discharges of toxic and other pollutants. The term *pretreatment* refers to the requirement that industries discharging pollutants treat their wastewater before discharge to municipal sewer systems.

The three objectives of the *National Pretreatment Program* are:

1. protect municipal wastewater treatment systems from interference caused by industrial wastes;

2. protect the nation's waters from industrial pollutants which pass untreated through wastewater treatment systems; and

3. provide for the beneficial use of wastewater biosolid as soil conditioners and fertilizers, by preventing excessive contamination by industrial pollution.

The U.S. EPA administers the National Pretreatment Program under the General Pretreatment Regulations, first adopted in 1978. These regulations, amended in 1981 and again in 1988, set forth specific requirements that both wastewater treatment facilities and industries must comply with to reduce industrial pollutant discharges. The *General Pretreatment Regulations* require that any wastewater treatment facility designed to treat over five million gallons a day of wastewater, or receives significant discharges from industrial sources, must develop a local pretreatment program conforming to EPA regulations. Under the *General Pretreatment Regulations*, the management and operating agencies must:

1. Develop local limits for toxic and other pollutants as necessary to protect sewage treatment operations, treated wastewater and biosolid quality.

2. Identify all commercial and industrial dischargers subject to regulation under the Pretreatment Program. These dischargers are referred to as significant industrial users.

2. Issue permits to all significant industrial users to control pollutant discharges, require discharge monitoring and reporting and, where necessary, require the installation of waste treatment facilities.

4. Monitor significant industrial user operations, discharges and reports to determine compliance with federal and local pretreatment standards and requirements.

5. Take appropriate enforcement actions against industries found to be in violation of applicable requirements. Depending on the seriousness of the violations, these enforcement actions may include monetary penalties and termination of wastewater service.

Individual sewage disposal systems

The wastewater service for the mountainous portion of the region can be achieved by one or a combination of three primary treatment schemes: 1) onsite individual wastewater treatment using a septic tank and drainage field system or alternate technology; 2) cluster wastewater treatment systems which connect multiple

households to a small treatment system using conventional or alternative technologies; and 3) centralized wastewater treatment facility to service the entire development community.

A non-centralized wastewater treatment facility comprised of treatment and disposal alternatives which serve individual or clusters of residences, can be a less costly alternative to the conventional central facility in a non-urban setting. Properly designed and constructed small alternative wastewater treatment systems can process sewage in a cost-effective, efficient and non-polluting manner. These alternatives can include both individual onsite systems and small collective treatment and disposal systems.

Because of economic constraints (including amendment 1 provisions), small communities and rural developments in the region need simple and low-cost wastewater treatment options. These wastewater options need to be defined in a community management plan. Through adoption of appropriate land use control policies and other controls, communities should be able to meet local wastewater management, water quality and development objectives.

An identified potential source of nonpoint source nutrients within some watersheds is derived from individual sewage disposal systems (ISDSs) where these systems are sited at or near urban densities. Calculations of accumulative phosphorus and nitrogen loadings from ISDSs, based on general literature data, shows these systems could be a major nonpoint source nutrient contributor in urbanized watersheds. However, there is considerable disagreement from ISDS users and some professionals on the general literature values and load calculations. Pollutant discharges from ISDS sources in urbanized watersheds have been identified by local, state and federal agencies as an area of concern.

An identified potential source of nonpoint source nutrients within some watersheds is derived from individual sewage disposal systems where these systems are sited at or near urban densities.

Septic and individual disposal systems are an acceptable means of waste disposal assuming they are designed and maintained properly. A well-engineered and maintained septic or individual disposal system can be protective of groundwater quality criteria, while not contributing to surface water degradation. However, poorly designed or failed systems frequently contribute to nonpoint source pollution in planning watersheds.

From a regulatory perspective, septic and individual disposal systems under 2001 gallons per day flow are the responsibility of state and local health departments rather than designated management agencies. These systems are to be designed, operated, inspected and maintained according to existing local health department regulations and recommendations. Septic or individual disposal systems designed for flows over 2000 gallons per day within existing service areas require approval from the appropriate management agency.

Systems over 2000 gallons per day are regulated as wastewater treatment works as defined in the state site application process. These systems are listed in the technical appendices of the *Clean Water Plan* as minor wastewater treatment facilities. Generally, these facilities do not require expansion within the planning horizon. Wastewater utility service areas for these facilities are generally very limited (less than 25 acres) and do not conform to the extent of urban growth boundary identified in the *Metro Vision Plan*. As a result, the technical appendices of the *Clean Water Plan* will site these facilities by watershed without mapping a wastewater utility service area.

Where feasible, areas served by septic and individual disposal systems will be encouraged to connect to a centralized treatment system which maximizes use of the system and avoids groundwater contamination resulting from septic and individual disposal system failure. In some cases, watershed water quality studies can make specific recommendations for septic and individual disposal systems. In these situations, the recommendations of the watershed studies can become the policy regarding septic and individual disposal systems within a specific watershed.

> Watershed studies can make specific recommendations for septic and individual disposal systems.

Wastewater management approval processes

Site approval process

> Site approvals are needed for construction or expansion of wastewater treatment works, lift stations, and major interceptor lines.

As part of the State Water Quality Act, site applications are needed for construction or expansion of wastewater treatment works, lift stations, and major interceptor lines. Final action on site applications is a function of the Water Quality Control Division after a review by appropriate local entities. The state act lists three items for the division to evaluate:

1. consider the long-range comprehensive plan for the area as it affects water quality and any approved regional water quality management plan for the area;

2. management of the facility on the proposed site will minimize the potential adverse impact on water quality; and

3. consolidation of wastewater treatment facilities whenever feasible.

The *Colorado Water Quality Control Commission* has refined these criteria in order to ensure that:

- existing treatment works are not overloaded when connecting new lift stations or interceptors;

- proposed treatment works are planned and constructed in a timely manner as needed;

- proposed treatment works are developed considering the local long-range comprehensive plan for the area as it affects water quality and any approved regional water quality management plan for the area;

- proposed treatment works or interceptor protects water supplies;

- proposed treatment works or interceptor has been properly reviewed by all necessary local, state, and federal government agencies and planning bodies;

- proposed location will have no foreseeable adverse effects on the public health, welfare, and safety;

- applicants will provide for adequate operational management, including legal authority and financial capabilities;

- proposed treatment works be located so that it is not unnecessarily endangered by natural hazards; and

- objectives of other water quality regulations will not be adversely affected.

The commission also encourages local governments to establish coordinated reviews and comment processes for site applications. The site approval regulation was revised in 1998 to improve efficiency and provide an opportunity for regional planning agencies to reduce redundant review processes. The site application regulation has established the following process:

> A*In the interest of facilitating a more effective and timely review of proposed new and expanded domestic wastewater treatment works, each planning agency may establish and implement a coordinated review and comment process to carry out the provisions of this regulation in coordination with its water quality planning responsibilities. Where a planning agency wishes to establish such a coordinated process, the division may enter into an agreement with the planning agency specifying the procedures for this coordinated process. The intent is to establish a single process 1) to meet these site approval requirements and 2) to meet the requirements for amendments to the water quality management plan. The process should be designed so that a new or expanded domestic wastewater treatment works which is approved as part of the water quality management plan may be*

concurrently deemed to also meet the requirements of these site approval regulations at the time of its inclusion in the plan. Under such a coordinated process, the division retains final authority for approval or denial of each project which is regulated under these site approval regulations."

Coordinated site approval process

DRCOG intends to sign an agreement with the Water Quality Control Division which specifies the procedures for this type of coordinated process. The wastewater utility plans are designed to meet the requirements of a *Clean Water Plan* amendment, the site application process, provide the planning information needed by the division in permitting process and the revolving loan program. The procedures will be developed in conjunction with the WRMAC and presented to the Metro Vision Policy Committee by June 1998.

Discharge permits

The discharge permit represents the basic tool for achieving water quality goals. It is a legally enforceable document, which can subject a violator to significant penalties. To meet the requirements of a permit, a discharger may have to spend considerable sums of money for both capital equipment and operating expenses. One function of the *Clean Water Plan* is to determine where water quality limitations are needed and to recommend appropriate limits. This is especially critical in complex urban watersheds where effluent of many facilities intermingles. Planning identifies the most cost-effective treatment method among various dischargers which will achieve the desired water quality.

The *federal Clean Water Act* requires discharge permits conform to an adopted water quality management plan.

The Clean Water Act requires all discharge permits for point sources to be in conformance with an adopted water quality management plan. In Colorado, the EPA has delegated permit writing and enforcement to the Water Quality Control Division. Regulations adopted by the Water Quality Control Commission require that *any agency responsible for the preparation of any approved water management plan under Section 208(b) of the federal act* be notified and allowed to comment on completed discharge permit applications.

Effluent limitations identified in the *Clean Water Plan* are based on adopted classifications and numeric standards. DRCOG uses the permit review process to assess if effluent limitations in a draft permit are consistent with the *Clean Water Plan*, including adopted local wastewater management strategies defined in wastewater utility plans. The review process allows any inconsistencies to be identified and resolved. In these cases, DRCOG notifies the division of the inconsistency and provides full documentation as to the reason for the inconsistencies. Before the final permit is issued, such differences are resolved.

Project review process

In accordance with the site approval process and other regulatory review processes, DRCOG will review all proposed water quality and wastewater management projects within the DRCOG planning region according to the following criteria:

Review for consistency with appropriate *Metro Vision 2020 Plans*

- extent to which the project is consistent with the *Metro Vision 2020 Clean Water Plan*;
- extent to which the project duplicates, opposes, or needs to be coordinated with other projects;
- extent to which the project might be revised to increase its effectiveness or efficiency;
- extent to which the project contributes to the achievements of areawide objectives and priorities related to natural resources and economic and community development;
- extent to which the proposed project significantly affects the environment;
- extent to which the project contributes to more balanced settlement and delivery of services to all sectors of area population including minority groups; and
- a decision by a collector/interceptor or treatment agency regarding capacity or other facility matters will be referred to all affected general-purpose governments.

Plan assessment process

The *Clean Water Plan* will be updated with concurrent activities of DRCOG and management agencies. The *Clean Water Plan* update is needed to assess if changes, which have occurred during the year, influence water quality planning at the local and regional level. The concept of an annual assessment allows the plan to be flexible and respond to growth and development in the metropolitan region. Additionally, a periodic update to areawide plans is required by the federal Clean Water Act and the State Water Quality Act.

The update process begins with the *Metro Vision 2020 Plan Assessment Process* and ends with the annual update to the plan. The Metro Vision Plan assessment provides the chance for member local governments or designated management agencies to request changes to the *Metro Vision Plan*, including the *Clean Water Plan* portion. When the DRCOG Board takes final action on the *Metro Vision Plan*, the approved changes are incorporated into the *Clean Water Plan*.

An amendment request should clearly define which elements of each plan are to be amended. In the case of the *Clean Water Plan*, those elements include facility location, service area through the year 2020, the sizing and staging of the treatment facility over the planning period, level of treatment required to meet adopted stream standards, alternative methods of treatment and disposal evaluated and identification of the designated management agency for the facility. DRCOG will inform concerned and affected agencies and prepare a staff analysis of the request. This review will focus upon the effect of the amendment on the integrity of the *Clean Water Plan* and the ability to achieve water quality goals in a cost-effective manner. Also, the request will be reviewed against the policies contained in the adopted regional development plan portion of the *Metro Vision 2020 Plan*.

Prior to the DRCOG staff analysis, the applicable management agency will review the request and prepare a recommendation. Both the DRCOG staff analysis and the management agency recommendations are forwarded to the WRMAC. The WRMAC will consider the amendment and recommend that the DRCOG Board either approve, conditionally approve or deny the request. Following advisory committee recommendations, the Board will schedule and hold a public hearing to allow all concerned and affected parties the opportunity to present their positions on the amendment. Following the public hearing process, the Board will consider and act on the amendment(s). If approved, the amendment will be incorporated into the *Clean Water Plan* and forwarded to the state for approval.

Amendment process requires a public hearing

The amended *Clean Water Plan* is forwarded to the Water Quality Control Division for its review. The division will determine if the amendment is minor or major. Minor changes, such as small service area boundaries, are agreed upon by the division, and the planning agency and management agency are not required to undergo an extensive review and public hearing process. Minor amendments to the *Clean Water Plan* are changes in which water quality impacts or major conflicts are not anticipated. Major changes warrant more consideration by the Water Quality Control Commission and will be subjected to a state public hearing process. Major amendments to the plan requiring specific action by the commission include:

1. Changes in planning or management agency designation.

3. Changes in the regional population as agreed to in the state/regional disaggregation process.

3. Changes that will cause significant impacts on a substantial portion of Colorado citizens.

4. Changes that potentially conflict with statewide plans or policies.

5. Changes that are likely to engender regional public controversy.

6. More than two state agencies express a strong interest.

Critical regional environmental resources

Policy direction has been developed related to water quality management and protection in wetlands, riparian corridors, groundwater aquifers and urban lakes.

Development patterns, natural physiographic features and special environmental resources (e.g., wetlands, riparian corridors, groundwater aquifers and urban lakes) have affected water quality management planning in the DRCOG region. Some of these environmental resources have been identified by local governments and other agencies as critical regional issues. Policy direction has been developed by the DRCOG Board related to water quality management and protection in wetlands, riparian corridors, groundwater aquifers and urban lakes. Land use patterns have been correlated to surface quality, which requires linking density patterns and distribution trends with regional water quality trends.

DRCOG as a planning agency is responsible for reviewing environmental assessments and environmental impact statements for consistency with adopted policies and management plans identified in the *Clean Water Plan*. The review process is designed to help maintain and protect critical regional environmental resources. Additional regional environmental issues can be evaluated by the WRMAC, the Metro Vision Policy Committee and the DRCOG Board for policy direction on an as needed basis.

Wetlands

There are a variety of wetlands in the eight-county DRCOG region. Some of these wetlands are important wildlife habitats, while others are used to improve urban runoff water quality. In fact, many of the wetlands in the urban area are associated with stormwater conveyance systems. As such, wetlands are a valuable regional resource, which serve multiple functions while providing opportunities for environmental diversity of plants and animals.

Both natural and created wetlands can provide water quality improvement benefits. Properly functioning, healthy wetlands help to protect and improve groundwater and surface water quality, control flooding, reduce or trap downstream migration of eroded sediments, provide critical habitat for plants and animals, provide aesthetic features and recreation, possess important historical values, act as buffers between water environments and developing areas, and increase the biodiversity of the natural environmental system.

Wetland types are very diverse, with some wetlands having significant ecological and social values while others are of little importance to natural systems or society. Various federal, state and scientific assessments of wetlands have identified them as an endangered natural resource, particularly at the federal and state levels. As a result, wetlands protection is a significant federal issue and the U.S. EPA has required all states to include regulatory wetland protection in their water quality standards and classification systems.

The definitions or classifications of what is a wetland and the criteria used to delineate wetlands should be scientifically valid and usable. The three essential characteristics of wetlands are hydrophytic vegetation, hydric soils and wetland hydrology. Wetlands are currently defined in the *Clean Water Plan* (as derived from the federal Clean Water Act) as:

> A*Those areas that are inundated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in a saturated soil condition."*

There are specific federal statutes (sections 401 and 404 of the 1987 Clean Water Act amendments) which govern activities involving wetlands. These regulations control discharges into wetlands and placement of dredge or fill materials into wetlands. The *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* provides the technical criteria, field indicators and methodology to determine whether an area is a jurisdictional wetland. Any scientific analysis of a wetland should be consistent with this manual. The WQCC is developing state standards and classifications for wetlands.

The definitions, classifications or delineations of wetlands must recognize regional variations. The federal government should not legislate specific wetland delineation criteria, but rather establish a procedure for administering agencies to develop regional delineation guidelines in consultation with states, regional agencies and independent scientific advisory committees. Since agencies at all levels of government should use equivalent definitions of wetlands for regulatory purposes, DRCOG will recognize wetland delineation consistent with Colorado and federal guidance.

Wetlands can have ecological and societal values which make them an important regional resource. DRCOG supports the concept of wetlands protection and all DRCOG plans will recognize the value of wetlands as part of the planning process. In recognition of this regional concept, DRCOG adopts the following positions.

…no net loss of wetland functions within the DRCOG region.

DRCOG's policy is *no net loss of wetland functions* within the DRCOG region, while encouraging cost-effective use of wetlands in urban design. Development within a designated

or delineated wetland should occur only when no other alternative exists. Wetland mitigation should consist of replacement wetlands of a similar type and quality, as determined by appropriate scientific analysis, which results in an equal (at the minimum) replacement of lost wetland functions. Wetland replacement within the same hydrologic watershed as defined in the *Clean Water Plan* is the preferred compensatory mitigation measure.

The DRCOG water quality position is as follows:

1. DRCOG promotes the use of wetlands for water quality enhancement. Regionally significant wetlands, which have scientifically measured and documented water quality enhancement features as mapped by DRCOG, in consultation with local governments and appropriate agencies, should be protected from loss.

2. Since streams and wetlands are very different environments which support vastly disparate plant and animal communities and process pollutants in different ways, numeric and narrative water quality standards developed for surface waters are not appropriate for application to wetlands.

3. Wetland-specific narrative standards which will protect the water quality dependent functions of wetlands are appropriate for wetlands. Wetland-specific numeric standards should only be established on a site-specific basis where problems exist.

4. The interaction between stormwater effects on wetlands and the ability of wetlands to improve water quality is of significant concern to local governments. DRCOG only supports wetland water quality standards and classifications if they recognize the role wetlands have in processing urban stormwater. Inflexible regulations may severely hamper the establishment of environmentally sound and economically feasible activities designed to protect the uses of wetlands.

5. DRCOG encourages the use of artificial and constructed wetlands that are created or constructed and maintained solely for resource management purposes, such as wastewater treatment, stormwater abatement and wildlife management. If these types of wetlands are already regulated by state or federal agencies, then additional regulations specific to wetland systems are not appropriate.

   Mitigation through wetland restoration or creation must be an essential component of wetlands management. DRCOG supports mitigation banking as a useful management tool to assist local governments in mitigating the loss of wetlands, while encouraging the creation and expansion of Colorado wetlands. For this reason, the Colorado Department of Natural Resources is encouraged to initiate a mitigation banking program as specified in state law. DRCOG would support a mitigation banking program consistent with its stated land use and water quality policies.

Riparian corridors

DRCOG supports the protection and enhancement of riparian zones throughout region.

Riparian zones or areas are generally comprised of the unique vegetation, soils and life forms that can be found adjacent to rivers, lakes and streams in the Denver region. These zones share some of the positive characteristics of wetlands and often include wetlands but are often saturated at much lower frequencies than wetlands. Riparian zones need to be identified on a local or regional level because of the variability of their form, function and values they represent. Riparian zones are important natural resources of the Denver region. DRCOG supports the protection and enhancement of riparian zones throughout the metropolitan Denver region.

This semi-arid region has a limited number of wetlands and riparian areas. These significant natural resources are an important part of the quality of life in the region. Local governments, citizens, and community organizations across the region have expressed concern for protection and maintenance of riparian zones because they:

- suppress the undesirable effects of flooding by absorbing and deflecting peak flows;
- maintain water quality by intercepting surface water flows and absorbing excess nutrients;
- provide for fish and wildlife diversity and abundance by creating roosting, nesting, rearing and feeding habitat for birds, mammals, fish and other forms of wildlife;
- serve as centers of biological diversity in arid and semi-arid ecosystems such as the Colorado plains; and
- provide aesthetic, recreational and educational benefits in the metropolitan region.

In recognition of this regional policy, DRCOG and local governments should take the following steps:

1. Utilize local government and other knowledgeable experts to develop a set of criteria that defines the characteristics, functions and values that make up riparian zones in the Denver region. Using these criteria, riparian areas should be mapped across the region by local governments or by a collaborative regional effort and this information provided to local governments, citizens and appropriate agencies for their use in planning and land development review.

2. The riparian policy could be used by local governments and by DRCOG in project review processes and as a decision making tool in the planning process. The

riparian policy will be considered in the siting process for all regional infrastructure including transportation and wastewater facilities.

3. Local governments could use this riparian policy as a means to encourage consistency in state and/or federal review and regulatory processes. DRCOG can use it to assist local governments involved in these review processes.

4. Local governments are encouraged to develop public education programs or other non-regulatory approaches for implementation at a local level. Examples of non-regulatory programs could include an "adopt a riparian/wetland program" where schools or other local organizations maintain existing riparian zones or wetlands, creation of educationally oriented facilities in riparian zones, or the purchase of riparian property for protection. DRCOG should assist local governments in the development of public education programs.

5. Local governments are encouraged to consider adopting a basic riparian management program. Basic components of this program could include an inventory of riparian resources, identification of locally significant riparian zones and a riparian zone protection ordinance. DRCOG should assist local governments by developing a model management program and a model riparian ordinance.

Groundwater

Groundwater quality is considered in the development of long-range management plans. Those activities which have the potential to adversely affect groundwater resources need to be properly managed. Groundwater recharge zones must be protected from water quality degradation.

Groundwater is an important source of agricultural and potable water for Colorado, constituting 18 percent of the total water used. There are many municipalities in the Denver region which rely on groundwater to meet their water needs. Groundwater quality is currently a significant water quality issue in some of these localities and is thus recognized in the *Clean Water Plan* as a regional water quality issue. Groundwater quality associated with watersheds should be considered in the development of long-range plans.

Groundwater quality has been affected by waste disposal, mine drainage, mineral processing, urbanization, nonpoint runoff and agriculture.

Groundwater quality in the Denver region has been affected by waste disposal, mine drainage, mineral processing, urbanization, nonpoint runoff and agriculture. Waste disposal and agricultural practices have been the primary sources of groundwater contamination identified in the Denver region. The use of septic disposal has resulted in biological contamination of rural and other water supplies. Contamination associated with urbanization, including nonpoint source runoff, can change groundwater quality.

There are 18 sites in the Denver region which have been identified as major waste disposal sites under the *Comprehensive Environmental Response, Compensation and Liability Act* (CERCLA) of 1980; *Federal Resources Conservation and Recovery Act* (RCRA) of 1976; *Installation Restoration Program* (IRP) of 1986; and a U.S. Department of Energy site under the *Radiation Control Act* of 1978. There are few programs to monitor groundwater quality away from these sites, except for public potable supply systems as required by the CDPHE.

The Water Quality Control Division (WQCC) of the CDPHE declared groundwater protection a statewide goal since passage of the *Colorado Water Quality Control Act* and the decree of Executive Order No. D0049-85. This led to adoption of groundwater standards in 1987 and subsequent amendments in 1990 and 1991 by the WQCC.

There is a need to prevent or control those activities which have the potential to adversely affect groundwater resources. The WQCD is in the process of developing groundwater classifications and regulations for specific sites in the state. The WQCC in 1991 adopted standards and classifications of the groundwater at the federal Rocky Flats site consistent with surface water standards and classifications (1990) for Walnut Creek and Woman Creek which drain the site (14 CRS 4, 4-91).

Metropolitan environmental strategies were designated in January 1989 by the Advisory Committee on Environmental Strategies for Metro Denver sponsored by the U.S. EPA. This committee identified groundwater quality as one of the highest environmental priority issues for metropolitan Denver. This committee specified a need for a state comprehensive groundwater contamination prevention program designed to protect existing and future groundwater uses. The general lack of data required for groundwater management programs was listed as an area of concern.

The increased use of groundwater for domestic supply in the metropolitan region in recent years has resulted in a rapid decline in groundwater levels in the underlying aquifers. There are about 17,365 permitted water wells in the metropolitan region with most of these wells (14,780) listed for domestic use. There have been fewer water wells registered in recent years compared to the high registration in the 1960s. Many of the domestic water wells are drilled into the alluvial aquifer with the Dawson formation in the bedrock aquifer the next most used aquifer.

The estimated annual average groundwater withdrawal from 1988 through 1997 is 66,000 acre-feet for the metropolitan region from all well types. This groundwater use can be divided into four use areas: municipal at 31,000 acre-feet; commercial and industrial at 12,000 acre-feet; domestic at 8,000 acre-feet; and irrigation at 15,000 acre-feet. The recharge rate to the alluvial aquifer is estimated to be less than 30,000 acre-feet per year, while the entire bedrock system recharges at about 40,000 acre-feet per year. The current groundwater usage equals the recharge rate. The United States Geological Survey (USGS) estimated the quantity of recoverable water in the alluvial aquifer as greater than 375,000 acre-feet, while bedrock aquifers have 68,500,000 acre-

feet of recoverable water (Robson 1987). The safe yield of either the alluvial or bedrock aquifers has not been established.

The South Platte alluvial aquifer has the poorest groundwater quality in the metropolitan region with contamination from industrial, federal, state and municipal facilities and operations. There are high levels of nitrate-nitrogen which exceed drinking water standards. Organic and metal pollutants and radiation groundwater contamination from CERCLA sites have been identified in water wells at various locations in the metropolitan region in recent years. The potential for alluvial groundwater contamination has been increased by air pollution.

The Central Adams service area, including Commerce City and the City of Brighton, continues to experience groundwater contamination problems. The CDPHE measured small concentrations of hazardous chemicals in domestic groundwater wells near Henderson in Adams County. Generally, these low-level contaminants are associated with the Rocky Mountain Arsenal site. Contamination of a public groundwater supply by trichloroethylene and diisopropylmethylphosphonate (DIMP) were measured in water wells in southwestern Adams County. The WQCD is developing statewide and site-specific DIMP standards. This water supply is under treatment at the new Klein Water Treatment Facility to remove these contaminants and other potential organic pollutants. The Brighton area has excessive levels of nitrate-nitrogen in the municipal water wells which supply most of the potable water in the region. The City of Brighton has built a new reverse osmosis treatment system to treat groundwater for potable use.

The WQCD has proposed classifying all alluvial groundwater aquifers within the state for domestic use. The contamination of some existing portions of the South Platte alluvial aquifer would make these areas unsuitable for domestic supply. A number of regulatory issues were presented to the WQCD in regards to this classification. As a result, the WQCC is involved in an ongoing effort to evaluate groundwater classifications and standards on a site by site basis.

Urban lakes

There are over 360 small variable bodies of water referred to as urban lakes.

There are over 360 named small variable bodies of water, excluding water supply reservoirs, within the metropolitan region, which are referred to as urban lakes. The technical appendices to the *Clean Water Plan* list urban lakes and associated surface acres. This list does not necessarily include all urban lakes, but identifies those with recreational potential. Most of these bodies of water are primarily used for agricultural irrigation with water rights owned by various ditch companies. Some of these urban lakes are owned by municipalities, counties and private agencies with uses ranging from recreation to stormwater collection.

These urban lakes are classified by the WQCC as class 2 warm water aquatic life. Urban lakes are subject to the basic standards, which include numeric limits for organic pollutants. Additionally, the class 2 warm water classification has specific water quality standards, which can be applied to these bodies of water. Some of the urban lakes support viable fisheries with the presence of reproducing fish species. Most of these urban lakes are capable of supporting a wide variety of warm water flora and fauna. Where there is a considerable amount of fishing activity at any of these urban lakes, an important economic benefit can accrue to the surrounding communities.

Urban lakes, with the exception of water supply reservoirs, were constructed for specific beneficial uses and have subsequently been used by residents in the metropolitan region for recreational purposes. Although their use for recreation and fisheries is applauded and should be encouraged, it is necessary to recognize that these facilities are sometimes drained for operation and maintenance. Therefore, the WQCC existing classification of class 2 warm water aquatic life is adequate to protect the basic uses of urban lakes. No additional upgrade in classification or change in standards is necessary or desirable unless shown otherwise by a community associated with an urban lake.

Land use and water quality

Regional land use development influences regional water quality trends.

Land use patterns have a strong influence on surface water quality. Since regional land use development can influence regional water quality trends, land use management must be considered in devising a water quality management strategy for a watershed or hydrologic system.

Land use types and development patterns are identified for existing conditions and future growth projections in watershed studies. The general categories recognized are single-family residential, multi-family residential, commercial, large lot and open space. Runoff from these land use types is modeled to assess effects to point and nonpoint source water quality.

Urbanization in the Denver region has proceeded at an average growth rate of one square mile per every additional 2,000 persons for the period 1960 to 1980. While this includes all land type uses, it suggests a residential pattern dominated by single-family residences. The average 1990 population density in the metropolitan service area was about 3,600 persons per square mile (DRCOG 1990). There are currently about 500 square miles of urban area. The future population density patterns and distribution trends will affect regional water quality trends.

Watershed management and land use choices should be viewed by regional officials as interactive components in their efforts at water quality enhancement. Since regional land use development can influence regional water quality trends, land use management must be considered in devising a water quality management strategy for a watershed or hydrologic system. Conversely, water quality must be considered in zoning and platting processes of local governments.

Environmental assessments and impact statements

All 404 permit applications are assessed against regional policies.

Environmental assessments and environmental impact statements will be reviewed for consistency with the *Clean Water Plan*. All 404 permit applications submitted to the U.S. Army Corp of Engineers will be assessed against the regional wetland policy, the riparian policy and water quality management plans identified in the *Clean Water Plan*. In watersheds with approved total maximum daily load allocation, total maximum annual load allocations or other appropriate wasteload allocation, the environmental assessments and environmental impact statements will need to address how alternative could affect these load allocations through a 20-year planning horizon.

Stormwater and nonpoint source management planning

Denver regional urban runoff program

In 1983, DRCOG completed the Denver Regional Urban Runoff Program (DRURP) which studied the nature of urban runoff, its influence on receiving waters and possibilities for control in the Denver region. Since the DRURP, DRCOG has been involved in six watershed studies which designed to assess the nature, severity and impact of stormwater and/or nonpoint sources on water quality. These efforts characterized urban runoff in relation to development patterns. The results have been developed into predictive planning tools to estimate stormwater and nonpoint quality, quantity and effects on receiving waters. Best management practices (BMPs) have been recommended, updated and incorporated as an integral component of watershed management plans. Watershed controls include both structural systems, nonstructural practices and institutional policies.

The DRURP showed large-scale nonpoint sources can impact receiving waters and encourages certain control strategies. The DRURP not only assessed the effect of urban runoff on receiving water quality but also described the quality and loading of urban runoff from several representative land uses in the region. This study found various land uses (commercial, single-family residential, multifamily residential, mixed-use) contribute significant and varying amounts of pollutants to stormwater runoff.

In an urban context, construction runoff with associated erosional components and runoff associated with urban activity are the primarily areas of concern. In relation to urban lake management, the major controllable nonpoint source parameter is phosphorus. The DRURP study identified sediments, metals, nutrients and specific metals as the parameters of concern. The long-term detrimental impact to receiving waters from nonpoint sources was not demonstrated.

Table 10 provides event mean concentration (EMC) of pollutants found in runoff from various land uses in the Denver region. These data includes EMC data collected during the DRURP and more recently as part of the stormwater permit application process for the cities of Aurora and Lakewood and the City and County of Denver. The results in the Denver region parallel, in many respects, the findings of similar studies across the country as shown in the National Urban Runoff Report (NURP). While these results are representative of general conditions within the Denver region, site specific data from watershed studies should be used when available. In general, constituents such as lead, zinc, cadmium, fecal coliform bacteria, and total residues were identified as significant pollutants in urban runoff.

Table 10 Event Mean Concentrations (EMC) in Mg/l of Constituents

Constituent	Natural Grassland	Commercial	Residential	Industrial
Total Phosphorus	0.4	0.42	0.65	0.43
Dissolved or Ortho-Phosphorus	0.1	0.15	0.22	0.2
Total Nitrogen	3.4	3.3	3.4	2.7
Total Kjeldahl Nitrogen	2.9	2.3	2.7	1.8
Ammonia Nitrogen	0.1	1.5	0.7	1.2
Nitrate + Nitrite Nitrogen	0.5	0.96	0.65	0.91
Lead	0.1	0.059	0.053	0.13
Zinc	0.1	0.24	0.18	0.52
Copper	0.04	0.043	0.029	0.084
Cadmium	0.0	0.001	0.0	0.003
COD	72	173	95	232
Total Organic Carbon	26	40	72	22-26
Suspended Sediments	400	225	240	399
Dissolved Carbon	16	30	41	12

Stormwater impacts to streams and rivers are difficult to quantify.

While the DRURP concluded that standards were exceeded, the long-term impacts to streams and rivers were unknown and difficult to quantify. This may not be the case with lakes, reservoirs and water supplies where water is stored and pollutants are trapped within a closed system. Nonpoint source loadings can be determined for these systems by model or mass load calculations.

Stormwater rule

The final rule change to the National Discharge Elimination System Permit Application Regulation for inclusion of a stormwater discharge regulation was issued on November 16, 1990 (Federal Register, Volume 55, No. 222). The stormwater rule regulates stormwater discharges associated with specific industrial discharges, discharges from separate large and medium municipal stormwater systems serving populations over 100,000. The stormwater regulation initially affects the cities of Denver, Aurora and Lakewood. Arapahoe County met the population requirements as a result of the 1990 census.

Phase II Stormwater Rule

Additionally, other smaller municipalities of less than 100,000 population that lie within the census bureau defined *urbanized area* will be included in phase II of the stormwater permit process by June 1, 2002. The phase II proposed rule was published January 9, 1998 in the *Federal Register* and is scheduled to become final after comments and revision on March 1, 1999. The proposed rule requires six minimum stormwater management programs be developed by each community: public education, public participation, illicit discharge elimination, construction site runoff control, post construction stormwater management, and pollution prevention for municipal operations.

Previously, stormwater discharge was associated with nonpoint source runoff and watershed management plans did not distinguish between nonpoint source and stormwater runoff. Future watershed management plans or updates should address stormwater management separate from nonpoint sources. Stormwater quality in relation to receiving water quality requires additional research and model evaluation.

The *Clean Water Plan* identifies stormwater discharge and quality as a regional water quality problem.

Stormwater discharge monitoring should be done on a regional basis with regional water quality assessments made on the effectiveness of management programs. DRCOG, in coordination with the Urban Drainage and Flood Control District, acts in an advisory capacity to permitted municipalities.

There are three major objectives of the stormwater discharge permitting program:

1. Reduce pollutant loadings in municipal storm sewer discharges to the *maximum extent practicable* (MEP).

2. Eliminate illicit wastewater connections, illegal discharges and non-exempt non-stormwater discharges to municipal storm sewer systems.

3. Implementation of management programs that apply best available technology (BAT), best conventional pollutant control technology (BCT) and, where necessary, water-quality based controls directed at controlling industrial stormwater pollution.

The structural and nonstructural best management practices listed in the Urban Drainage and Flood Control District *Criteria Manual Volume 3* are widely applicable to the metropolitan region. DRCOG supports these best management practices for stormwater and nonpoint source management. Future application of the stormwater rule to small towns and cities will create an economic hardship and many of these communities will not be able to comply. Options for small communities need to be made available.

Nonpoint source assessment

The WQCD developed a statewide nonpoint source assessment report and has recommended ongoing management programs in conjunction with a Nonpoint Source Task Force. The task force serves as an advisory and work group to assist the WQCD with the nonpoint source program. The task force has formal rules of operation and is comprised of government agencies, special interest groups and regional planning organizations. DRCOG is a founding member of the task force and continues to be actively involved in programs related to urban and construction runoff in the metropolitan region. The WQCD and task force play a role in the continuing effort to identify nonpoint source problems and issues in Colorado, then propose programs and projects designed to demonstrate and promote best management practices (BMPs) while providing educational opportunities.

The priority nonpoint source watersheds in the DRCOG region are Bear Creek, Cherry Creek, Chatfield and Upper Clear Creek.

Statewide assessments and management programs for nonpoint sources are identified in the *Colorado Nonpoint Source Assessment Report 1989 Addendum* and the *Colorado Nonpoint Source Management Program* Reports (CDH 1989a: 1989b). The assessment report identifies significant nonpoint source problems in the Cherry Creek, Chatfield, Bear Creek, Lower Clear Creek, Lower South Platte (Barr Lake), Upper Clear Creek and Big Dry Creek (Standley Lake) planning watersheds. The nonpoint management program is fully approved by EPA. Nonpoint source metal and nutrient loadings from the Upper Clear Creek watershed are potentially degrading water quality in Standley Lake. DRCOG produced an educational video production on urban and construction nonpoint source runoff from urban development (DRCOG 1992).

In 1991, there were two additional projects funded for the metropolitan region: Boulder Creek restoration and a biologically-based phosphorus removal system for Chatfield Watershed. The constructed LEMNA pond system is removing nutrients from Plum Creek, but additional data needs to be collected to assess the effectiveness of the system. Although the Boulder Creek restoration program is still in progress, the 319 grant portions of the project have been completed. The Denver Public Health Department has received a two-year 319 grant to assess the usefulness of bioassessment in identifying water quality measures. In 1997, the DRCOG produced a training video on *Keeping Soil on Site.*

The four major topics related to urban runoff and construction activities which should be a priority for 319 nonpoint source program support and are a priority for the DRCOG region include the following:

1. Education of the general public in urban centers through source control or preventive programs which can include, but are not limited, by the following: Use and disposal of household waste products; Application of fertilizers, pesticides, insecticides and similar products; Landscape design and effective uses of vegetation to reduce small lot erosion; Construction-related erosion control; and Other urban runoff pollution prevention activities.

2. Education of the workforce related to nonpoint source control and prevention programs which can include, but are not limited by, the following: Develop Best Management Practice training programs, dissemination materials, classroom curriculum and other teaching aids; Develop Best Management Practices guidance documentation; Landscape design and effective uses of vegetation to reduce construction related erosion; Other construction-related erosion control and prevention programs.

3. Education of local governments and state decisionmakers in urban centers related to nonpoint source problems with an emphasis on control and prevention programs which can include, but are not limited by, the following: Regulatory programs directed at erosion control, zoning or other special regulations or ordinances; Planning level identification of available control and prevention long-term and near-term alternatives and cost-effectiveness of alternatives; and Urban design and development prevention programs.

4. Demonstration and evaluation of best management practice control and prevention practices and structures, including stormwater practices or structures, related to urban development or construction activities.

Final '319 Grants Guidance states the following five urban runoff management activities are activities eligible for '319(h) funding:

1. Technical assistance to state and local stormwater programs that address stormwater runoff not covered by NPDES Permit Program.

2. Source and runoff control BMP implementation (except discharges covered by the NPDES Permit Program).

3. Information and education programs.

4. Technology transfer and training.

5. Development and implementation of regulations, policies and local ordinances to address stormwater runoff not covered by the NPDES Permit Program.

The use of '319 funds for stormwater/urban runoff education and information programs, training and technology transfer is restricted to activities not subject to NPDES Phase I municipal stormwater permit program requirements unless such activities are part of a statewide, regional or watershed effort. Funding of activities where consistent statewide, regional or watershed coverage is intended, would be permissible. Training and information activities oriented for the community at large may include audiences or participants in municipalities that are subject to Phase I permit requirements.

Section '319 of the act recognizes the water quality impacts from nonpoint sources. This section required states to assess the magnitude and pervasiveness of nonpoint source pollution on receiving waters. It further requires the development of a state management plan, which included implementation of demonstration and educational program to reduces these identified water quality problems. All of the nonpoint point assessment data available for the metropolitan region was incorporated into the state assessment report. Existing nonpoint control strategies used in the metropolitan region were included in the State Management Plan.

Recommended best management practices

Several types of structural and nonstructural measures were evaluated during USEPA's Nationwide Urban Runoff Program (NURP). These include detention devices, recharge devices, housekeeping practices, and miscellaneous devices. Detention devices include dry detention basins, wet detention basins, dual-purpose basins, oversized drain pipes, and catch basins.

Wet detention basins and the dual-purpose basins are effective in removing nonpoint pollutants from urban runoff. The wet detention basins employ a permanent pool, which catches runoff from both large and small storms. Wet detention basins are efficient in removing particulate of sediment, lead and coliform bacteria. Soluble phosphorus and nitrogen are removed effectively because of biological activity within the permanent pool area. Results for soluble metals such as copper and zinc are still inconclusive.

Extended dry detention basins are also effective in removing pollutants, except for soluble nitrogen and phosphorus. Dual-purpose basins are built to be dry during non-storm periods, but catch and detain all storm flows while providing slow release rates through specific outlet designs. These basins do not have a permanent pool and can not provide the biological activity to remove soluble pollutants. Dual-purpose basins are particularly amenable to urban areas that have flood control or catch basins already in place. These basins can be converted to effective runoff detention basins through outlet redesigns. In these cases, dual-purpose basins are very effective from a benefit/cost perspective. The effectiveness of both wet and dual-purpose basins is dependent upon the basin’s design. There must be adequate basin volume to provide

several hours of detention for particulate to settle out. Basin volume to runoff volume ratios of greater than 3.0 provided the highest removal efficiencies.

Other structural controls evaluated during NURP studies included recharge devices and infiltration basins. Infiltration basins collect storm runoff flows and then by gravity, storm runoff infiltrates through the soil and porous pavement into the groundwater system. The effectiveness of recharge devices is highly dependent upon site conditions, such as climate, slope, soil texture, depth to water table, and proximity to water supplies. The treatment rate is determined by soil infiltration rate and percolating area of the recharge device.

Stormwater and erosion control best management practices improve water quality in discharges from construction sites and in urban areas.

Other controls evaluated in NURP studies included street sweeping, wetlands and grass swales. Street sweeping and grass swales did not significantly reduce pollutant loadings from urban areas. However, this conclusion was tempered by variability in the results, which suggested that increasing detention time of the runoff within the swale could significantly reduce pollutant loads. Wetlands have been evaluated as an effective nonpoint source practice for specific locations and hydrologic conditions.

The best management practices (BMPs) fall into two categories: erosion control BMPs, which are intended to provide improved water quality in discharges from construction sites, and urban stormwater BMPs, which are intended to reduce loads after the construction phase is complete (e.g., phosphorus and nitrate which stimulate aquatic weeds and algae).

Stormwater BMPs supplement existing urban runoff and flood control practices. Recommended practices are directed toward improving water quality. In addition to the recommended BMPs, model ordinances for erosion control and stormwater quality are part of any management program. Model ordinances are intended to provide guidance to communities which may want to adopt such ordinances, or update their existing ordinances. Model ordinances have been developed by DRCOG and the Urban Drainage and Flood Control District in concert with many local municipalities in the Denver region. Either of these model ordinances is applicable to urban areas throughout the DRCOG region.

The recommended BMP list requires periodic updating, since demonstration or application of BMPs under Colorado conditions can prove the merit, or conversely prove the flaws, of various BMPs. Additionally, emerging technologies could be added to the management program. For these reasons, it is recommended that this management program and the BMPs be reviewed at least every five years.

The impact of the recommended BMPs to groundwater is an item which still requires research and further evaluation. Many of the urban or long-term practices are generally

untested in Colorado. A concern about the impact of these practices, particularly the structural practices, to groundwater has been noted by many agencies. It is therefore imperative that any demonstration of these practices take into consideration design features and monitoring programs, to determine groundwater impacts, if any, caused by the practice. This information, as it is generated, may then be used to update the structural practices.

BMPs require careful planning, design, and construction as well as a long-term financial commitment to operation, maintenance and replacement. A planning process which ensures selection of the proper BMPs is also essential. Recognition of the financial commitment involved not only in construction, but also in the long-term operation, maintenance and replacement is critical. Without a commitment to the long-term operation and maintenance requirements of BMPs, the initial capital investment and resulting water quality improvements could be lost. Agencies, municipalities or private organizations which have the ability to raise funds, must be involved in the long-term maintenance of constructed BMPs.

The structural and nonstructural best management practices are based to a large extent on those described in the *Urban Drainage and Flood Control District Drainage Criteria Manual*, Volume 3. This set of best management practices is the most appropriate control methods for stormwater and nonpoint source runoff associated with urban areas and construction activities in the DRCOG region. Erosion and sediment control practices are summarized in Tables 11 and 12.

Table 11 Structural and Nonstructural Best Management Practices

Best Management Practice	Planning Considerations
STRUCTURAL BEST MANAGEMENT PRACTICES	
1. Minimizing Directly Connected Impervious Areas	Design site drainage flow path to maximize flow over vegetated area; minimize ground slopes to limit erosion and slow down flow; select vegetation for survival values and water quality benefit
2. Irrigated Grass Buffer Strips	Design is based on maintaining sheet-flow conditions across a uniformly graded, irrigated, dense grass cover strip
3. Grass-lined Swales	Use grass-lined swales to decrease runoff volumes and pollutant loads; design is based on directing runoff to low gradient, vegetated swales that are irrigated
4. Extended Detention basins (dry basins)	Rely on an outlet designed to extend the emptying time of the basins capture volume; design embankment-spillway-outlet system to prevent catastrophic failure; design to empty capture volume over a 40-hour period
5. Retention Ponds (wet ponds)	Requires a base flow to maintain and to flush a permanent pool; designed to empty capture volume over a 12-hour period; design embankment-spillway-outlet system to prevent catastrophic failure
6. Constructed Wetlands	Can be constructed as a wetland basin or set into a drainage way to form a wetland bottom channel; requires a base flow to maintain wetland vegetation; pollutant removal efficiencies of constructed wetlands vary significantly; removal efficiency design factors include influent concentrations, hydrology, soils, climate, vegetative type, growth zonation, maintenance and harvesting
7. Modular Block Porous Pavement	Design for even flow distribution over the entire porous surface; assume permeable pavement area are 30 percent impervious with subsoil infiltration and 60 percent impervious with no subsoil infiltration
NONSTRUCTURAL BEST MANAGEMENT PRACTICES	
8. Stormwater Quality Control Planning	The implementation of this BMP is in the form of adoption or promulgation of ordinances, resolutions or executive orders granting authority to local government staff to review stormwater quality control plans and to either approve or present recommendations to elected officials for their approval; requires a commitment of staff and fiscal resources of the local government to follow through with review, approval and enforcement of site-specific plans; regulations must be adopted specifying the content of stormwater quality control plans
9. Adoption of Criteria and Standards	The adoption by local governments of criteria and standards for the selection, planning and design of stormwater facilities
10. Source Reduction and Disposal of Household Waste and Toxics	The goal of household waste disposal is to contain all refuse, reduce litter and encourage proper waste disposal practices through public education programs; encourage and coordinate with recycling, resource recovery programs, alternative approaches and product selection programs
11. Use of Pesticides/ Herbicides/ Fertilizer/ Alternative Management	The development of an ongoing educational program is the basis of this BMP; encourage proper application technologies, composting, alternative pest control practices and integrated landscape management programs and practices

Table 11 Cont. Structural and Nonstructural Best Management Practices

Best Management Practice	Planning Considerations
12. Illicit Discharge Controls	Activities designed to reduce entry of pollutants into municipal stormwater systems during dry-weather periods; educational and information dissemination programs which address illegal dumping, accidental spill response and illicit connections
13. Landscaping and Vegetative Practices	Development and distribution of guidelines and educational materials on landscaping and vegetative utilization for urban development area; fugitive dust and bare-ground re-vegetative local ordinances; Integrated landscape management practices
14. General Education Programs	All of the above nonstructural best management practices have an educational component; Additionally, general education programs directed toward construction-caused nonpoint source runoff, stormwater management and urban runoff as necessary as a type of source prevention

Table 12 Erosion and Sediment Control Practices

Control Type	Summary of Practice Criteria
1. Sediment / Erosion Control Plan	Erosion and sediment control planning should occur early in the site development process and be adjusted throughout site development as needed; These plans should define the erosion and sediment control practices and include a drainage way protection plan, if necessary
2. Erosion Control	Surface roughening provides temporary stabilization of disturbed areas from wind and water erosion; surface roughening should be performed after final grading to create depressions 2 to 4 inches deep and 4 to 6 inches apart
	Mulching of all disturbed areas should occur within 14 days after final grade is reached on all portions of site not permanently stabilized
	Revegetation of a viable vegetative cover should occur within one year on all disturbed areas and stockpiles not permanently stabilized; Temporary vegetation is required on all disturbed areas having a period of exposure to final stabilization of one to two years; permanent vegetation is required on all disturbed areas having an exposure period longer than two years
	Roads and soil stockpiles should be covered as early as possible with the appropriate aggregate base; all non-paved road portions should be seeded and mulched within 14 days after final grading; stockpiles in place over 60 days should have temporary vegetation; stockpiles with 100 feet of drainageways need additional sediment control structures
3. Sediment Control	Vehicle tracking of mud and dirt onto paved surfaces should result in cleaning of paved surfaces at the end of each day; for sites greater than two acres, a rock pad should be built at points of ingress and egress
	Slope diversion dikes located above disturbed areas may discharge to a permanent or temporary channel; diversion dikes located mid-slope on a disturbed area must discharge to temporary slope drains; diversion dikes located at the base of a disturbed area must discharge to a sediment trap or basin
	Roads and roadside swales should be provided for when road areas are not paved within 30 days of final grading; terracing and slope drains can be used in steep slope areas Sediment entrapment facilities include terracing, slope drains, straw bale barriers, silt fences, filter strips, sediment traps and sediment basins; at least one entrapment facility should capture run off leaving a disturbed area
4. Topsoil Preservation and Reuse	As a minimum, topsoil preservation and reuse involves the removal, stockpiling, and re-spreading of the surface six to eight inches of natural soil.
5. Drainage-way Protection	Waterway crossing practices should limit construction vehicles in waterways to the maximum extent practicable

Table 12 Cont. Erosion and Sediment Control Practices

Control Type	Summary of Practice Criteria
	Temporary crossing or diversions are needed for actively-flowing water courses with regular crossing of construction vehicles
	Outlet protection temporary slope drains, culverts, sediment traps and sediment basins must be protected from erosion and scour; check dams can be used in swales and ditches to protect these from down-cutting
	Inlet protection, all stormwater sewer inlets, made operable during construction must have sediment entrapment facilities installed to prevent sediment-laden water from entering the inlet
6. Material Storage Practices	Chemicals, petroleum products and waste storage practices should be designed to prevent discharge of any stored material into the runoff from a construction site
7. Underground Utility Construction	Trench dewatering devices must discharge in a manner not to adversely affect flowing streams, wetlands, drainage systems or off-site property; limit the amount of open trench to 200 feet
8. Disposition of Temporary Measures	All temporary erosion and sediment control measures must be removed within 30 days after final stabilization
9. Maintenance	All temporary BMPs shall be maintained and repaired as needed to assure continued performance during the construction phase of a project

All of the nonstructural best management practices have an educational component. There is also a need for general education programs related to construction nonpoint source runoff, stormwater discharge and other urban runoff. Specific education programs need to be directed toward the construction industry in the DRCOG region and throughout Colorado. Sediment is one of the most prevalent nonpoint source runoff components associated with urban development and construction activities. Similar best management practices are applicable to both stormwater runoff in urban areas and construction site runoff.

Water supply integration recommendations

Major water supply projects are a regional issue with long-term water management implications.

Proposed and existing water supply projects have a potential to affect water quality and water quality management plans in the metropolitan region. Major water supply projects are a regional issue with long-term water management implications. Through the *Metro Vision Plan* development process, an evaluation of the supply and demand projections for the metropolitan region was completed that suggested demand would exceed the supply

between the planning years 2010 and 2015. Development of all potential sources and additional conservation could extend the supply until 2020. *Metro Vision Plan* recognizes that additional water supply projects will be needed to meet the demand in the metropolitan region.

The *Clean Water Plan* identifies water supply projects and lists those projects which do or could affect water quality within the DRCOG planning region. Regional supply and demand information should be incorporated in the *Clean Water Plan* for use as a watershed management tool.

The cities of Aurora, Central City and Thornton, the Town of Superior, Arapahoe County and the Parker Water and Sanitation District are developing water supply programs which could affect regional water quality management plans. As these projects develop, water quality issues should be assessed and relationships to regional water quality identified in the *Clean Water Plan*.

The Denver Water Department=s mission historically has been to provide its customers in the City and County of Denver and its contract distributors with high quality water and excellent service at the lowest possible price. While this mission continues, Denver=s approach to water supplies has undergone profound change in the past several years. In part, this change resulted from a new and complex political regulatory environment that culminated in the federal government=s veto of the proposed Two Forks dam and reservoir project in 1991. With the project=s veto, the Denver Water Department moved to redefine the limits of its service area and to reassess its traditional assumptions for providing the water supplies needed to meet customer demand within the existing service area.

To determine its future water needs, Denver Water Department conducted an Integrated Resource Planning (IRP) study. The IRP study began in 1993 and culminated in a resource statement issued by the Denver Board of Water Commissioners in October 1996. Among the results of the IRP process was the decision to implement several near-term projects, including conservation, reuse and system refinements to provide water needs through the year 2030.

The Denver Board of Water Commissioners has begun the pre-design phase of its nonpotable reuse water project. This project is anticipated to serve a demand of 15,100 acre-feet of water for irrigation and industrial uses in the department=s northeast service area. The reuse plant will take secondary treated water from the Metro Reclamation facility for treatment. The project will be implemented in three phases.

The first phase, scheduled to begin in 2001, will serve customers around the plant that will be located in Commerce City. Some of these customers include a power plant, the Metro Reclamation facility, oil refineries, and a golf course. The second phase of the project will primarily serve irrigation water to Stapleton redevelopment and Lowry redevelopment for planned parks and golf courses. The third phase will serve water to

parks in the Montbello area, and irrigation needs in the Gateway and Green Valley Ranch areas. This phase will also serve reuse water for irrigation, the rental car washes and the central cooling plant at Denver International Airport. The entire cost of the project is currently estimated to be $102 million.

V. SUMMARY OF WATERSHED QUALITY & WASTEWATER MANAGEMENT

Watershed water quality assessments and wastewater management strategies are available for the 11 DRCOG designated watersheds.

Total maximum daily load allocation studies have been completed or are in progress for seven of the watersheds. Total maximum daily load allocation studies are not required at this time for the plains watersheds. Management agency types vary from one watershed to another with watershed associations, watershed authorities, general-purpose governments and special districts functioning as management agencies. The following chapter summarizes the system of wastewater treatment facilities by watersheds and identifies general management strategies.

Bear Creek Watershed

Status of total maximum daily load allocation program

Bear Creek Watershed Association

The Bear Creek Watershed total maximum daily load allocation study was established through a Clean Lake Study (DRCOG 1989). The study resulted in the Bear Creek Basin Control Regulation (Water Quality Control Commission Regulation 74) and a narrative standard for the reservoir. The critical water quality parameter selected in the TMDL process was phosphorus. The allocation process was designed to target phosphorus reductions and alter the trophic status of Bear Creek Reservoir through systematic application of best management practices and point source controls.

Bear Creek Reservoir has a water quality goal established by the Water Quality Control Commission instead of a numeric standard. The reservoir goal, as defined by the site-specific narrative standard, listed in the Basin Control Regulation (WQCC 1996) reads as follows:

> A*Concentrations of total phosphorus in Bear Creek Reservoir shall be limited to the extent necessary to prevent stimulation of algal growth to protect beneficial uses. Sufficient dissolved oxygen shall be present in the upper half of the reservoir hypolimnion layer to provide for the survival and growth of cold water aquatic life species. Attainment of this standard shall, at a minimum, require shifting the reservoir trophic state from a eutrophic and*

hypereutrophic condition to a eutrophic and mesotrophic condition, based on currently accepted limnological definitions of trophic states."

A point source poundage and concentration allocation was established for permitted point sources. The application of best management practices by general-purpose governments will result in the reduction of erosion products reaching the reservoir. The management program targets load reductions at the reservoir as measured by reservoir trophic indicators. The Bear Creek Watershed TMDL allocations are depicted in Table 13.

Table 13 Bear Creek Watershed TMDL

Allocation	Endpoints	Target
Point Source Wasteload Allocation	Total phosphorus effluent poundage limit	The total wasteload allocation for all point sources of phosphorus in the Bear Creek Watershed is 5,255 pounds per year. Each individual discharger is limited to an annual wasteload of total phosphorus.
	Total phosphorus effluent concentration limit	Point source discharges can not exceed a total phosphorus effluent concentration of 1.0 mg/l as a 30-day average
Nonpoint Source Load Allocation	Reservoir narrative standard	Jefferson County, Clear Creek County, Park County, municipalities, and districts in the Bear Creek Watershed will implement best management practices for control of erosion and sediments.
	Monitoring trophic status indicators	At a minimum, local entities in the watershed will ensure that water quality monitoring is conducted on Turkey Creek, Bear Creek, and in Bear Creek Reservoir on a monthly basis to measure the phosphorus loadings reaching the reservoir and other factors which affect the water quality, as well as the attainment of beneficial uses for the reservoir.

The total wasteload allocation of 5,255 pounds for phosphorus was established from the projected growth in the year 2000. This pound restriction will allow controlled development in the watershed and not cause a growth restriction. The poundage allocation also represents a 75 percent reduction in point-source discharge in the basin. Coupled with ditch diversion this represents a substantial reduction in reservoir phosphorus loading. The wastewater facilities will not be allowed to exceed either the

effluent concentration value or the poundage allocation. By establishing a poundage limit, facilities can more easily plan for future reductions in effluent phosphorus limits, as they near their allocation limit.

The reservoir narrative standard operates in conjunction with the Bear Creek Reservoir Basin Control Regulation. This flexibility is needed due to the uncertainty in predicting the specific in-lake phosphorus concentrations required to achieve the clean-up goal and in predicting the reservoir response to algae growth from nutrient reductions.

The external loading of phosphorus to the reservoir has been dramatically reduced over the past six years with the lowest recorded values occurring in 1996. The point source controls have been effective in reducing phosphorus loading in the watershed. The internal load of phosphorus is still providing sufficient phosphorus to cause periodic phytoplankton blooms. Increased concentrations and loading of nitrate-nitrogen from the watershed is a concern to the association. The association has proposed some special monitoring activities to better characterize this nonpoint source loading problem. The changes in nutrient dynamics in the reservoir will require the association to re-evaluate reservoir models and determine if a more appropriate predictive model is needed.

The association=s continued implementation of water quality management programs has resulted in water quality improvements, with the reservoir system beginning a shift toward a more eutrophic status. The association will evaluate nonpoint source implementation activities in its management program which should lead to both short-term implementation and long-term management programs.

Management agency

The Bear Creek Watershed Association is the designated water quality management agency for the Bear Creek Watershed (Figure 7). The watershed boundary recognizes drainage from Park County into Jefferson County. The Jefferson County Mountain Water Quality Association, City of Lakewood and the Bear Creek Management Plan Committee were formed into the *Bear Creek Watershed Association* by a memorandum of understanding (BCWA 1996) with an adopted set of bylaws (BCWA 1996). Park County became a member of the association.

The eligible membership entities in the Bear Creek Watershed Association include the City of Lakewood, Town of Morrison, Clear Creek County, Jefferson County, Park County, Evergreen Metropolitan District, West Jefferson County Metropolitan District, Genesee Water and Sanitation District, Kittredge Sanitation and Water District, Willowbrook Water and Sanitation District (nonpoint source only), Forest Hills Metropolitan District, Jefferson County Schools, Conifer Center Sanitation Association, West/Brandt Foundation (also called Singing River Ranch), Brook Forest Inn, Bear Creek Development Corporation (Tiny Town), and Bear Creek Cabins (formerly

Davidson Lodge). The operating agencies in the Bear Creek Watershed are listed in Table 14.

The watershed association provides the framework and opportunity for joint participation in planning, coordinating and reviewing activities for the purpose of implementing a continuing areawide water quality and wastewater management program. Membership entities are designated general purpose governments, special districts and all other National Pollutant Discharge Elimination System (NPDES) permittees as designated by the Water Quality Control Division of the CDPHE in the Bear Creek Watershed.

The Bear Creek Watershed Association consists of all membership entities and designated participants. Designated participants are all entities, other than membership entities, that demonstrate vested interest and support for the Bear Creek management program as defined in the regional *Clean Water Plan*. Membership entities are given a vote on all matters pertaining to management agency, operating agency and general-purpose government responsibilities as defined in the memorandum of understanding.

The association's memorandum of understanding describes the roles and responsibilities of the management agency, operating agencies and general-purpose governments as related to water quality management activities in the Bear Creek Watershed. The association as the designated management agency provides three primary benefits:

- ensuring an effective regional water quality management program, which is consistent with the control regulation and recommended in the *Clean Water Plan*;
- ensuring cost-effective local wastewater management systems within the parameters of the *Clean Water Plan*; and
- identifying and managing activities that ensure compliance.

The management agency is responsible for implementing approved water quality strategies, decides on the need for and specific characteristics of wastewater treatment processes and the details of implementation within specified parameters. A watershed association approach provides a subregional opportunity to coordinate water quality activities.

Wastewater management plan

The Bear Creek Watershed Association develops an annual report for submittal to the Water Quality Control Commission as required in the *Bear Creek Reservoir Control Regulation*. This annual report characterizes wastewater management activities, changes to the management program and characterizes reservoir water quality and compliance with the reservoir narrative standard. This report is also recognized in the

Clean Water Plan as the required annual submittal of the management agency. The technical appendices to the *Clean Water Plan* contain detailed information about the wastewater treatment facilities and water quality assessments. Technical appendices will be maintained on an as-needed basis to reflect management agency activities. Operating agencies in the watershed include the Town of Morrison, Evergreen Metropolitan District, West Jefferson County Metropolitan District, Genesee Water and Sanitation District, Kittredge Sanitation and Water District, Forest Hills Metropolitan District, Jefferson County Schools, Conifer Center Sanitation Association, West/Brandt foundation, Brook Forest Inn, Bear Creek Development Corporation, Bear Creek Cabins, Geneva Glen and Jefferson County High School.

The total wasteload allocation for all point sources of phosphorus in the Bear Creek Watershed is 5,255 pounds per year. Table 15 shows the control regulation total phosphorus allocations for permitted point sources. In 1996, the point sources produced a total annual discharge of 1,763 pounds of phosphorus (34 percent of the total allocation) as shown in Table 15. All wastewater treatment facilities are in compliance with the control regulation poundage allocations.

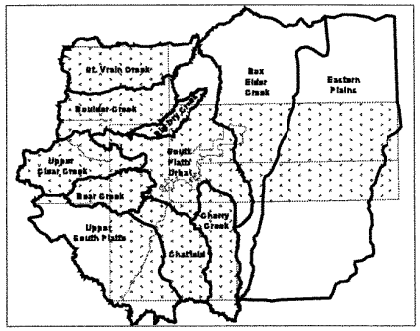


Figure 7
Bear Creek Watershed

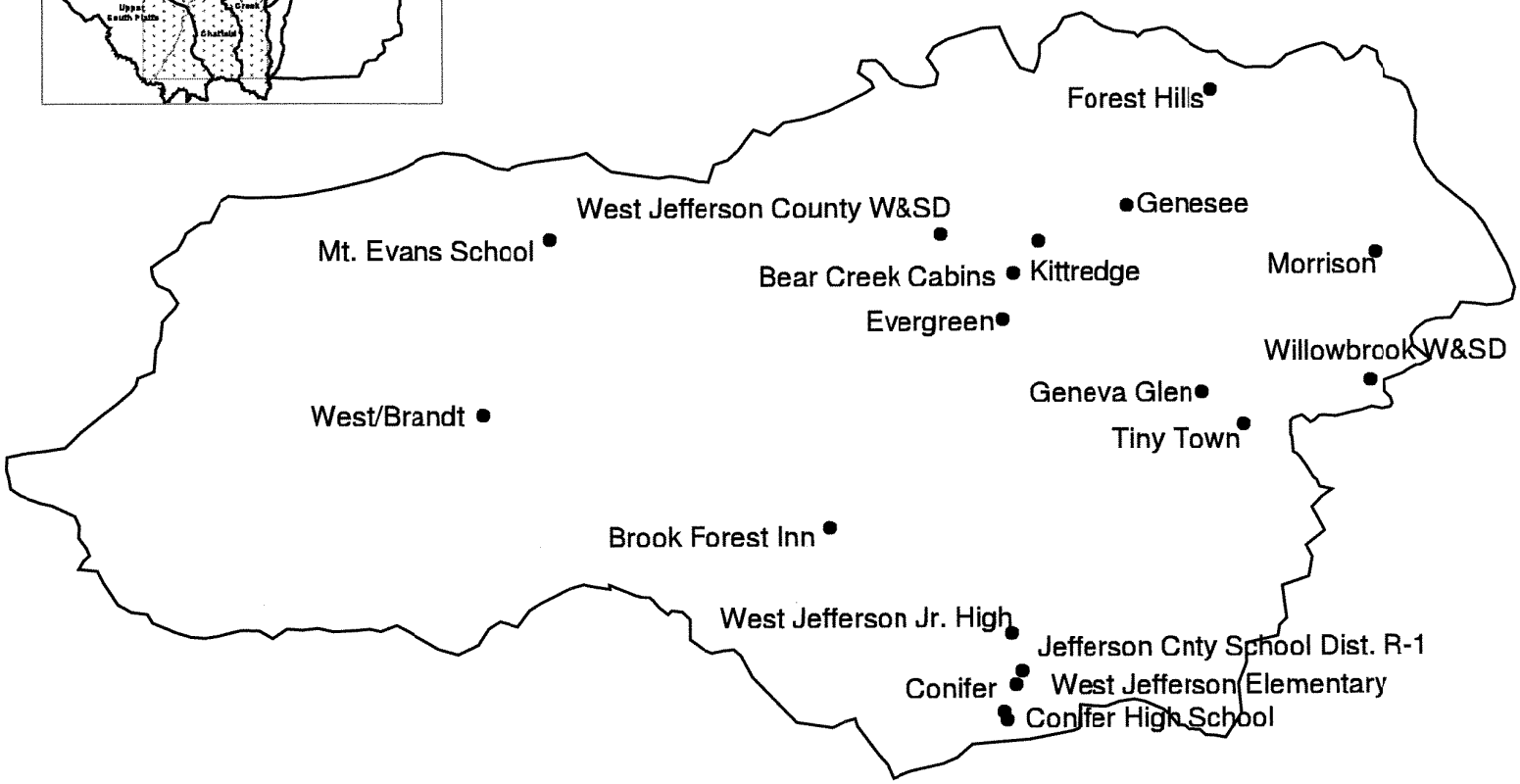


Table 14 Bear Creek Watershed Permitted Wastewater Treatment Facilities

Operating Agencies	Permit	Facility Size	Design Capacity		Estimated Date at		2020 Needed Capacity	
			Hydraulic (MGD)	Organic (lbs/day)	80% Capacity	95% Capacity	Hydraulic (MGD)	Organic (lbs/day)
Brook Forest Inn	CO-0030261	Minor	0.009	18				
Conifer High School	CO-0044644	Major	0.052	220				
Conifer Sanitation Assoc.	CO-0040096	Minor	0.019	135	2010	2015		
Cragmont	Proposed							
El Rancho WWTP	CO-0026522	Merged	0.026	85				
Evergreen Metro District	CO-0031429	Major	1	2085	2010	2010	1	2085
Forest Hills	CO-0037044	Major	0.05	96	2000	2010	0.05	30
Fort Restaurant	Proposed	Minor						
Genesee Water & Sanitation	CO-0022951	Major	0.8	1340	2010		0.68	1530
Geneva Glen Camp	CO-0044652	Minor	10500	29				
Kittredge Sanitation District	CO-0023841	Major	0.07	334				
Morrison, Town of	CO-0041432	Major	0.2	420			0.5	
Mt. Evans Outdoor School	CO-0032514	Minor	0.004	59.3				
Tiny Town	CO-0036129	Minor	0.005	20	2015	2015		
W. Jefferson Elementary	CO-0043176	Minor	0.0012					
West Jefferson W&SD	CO-0020915	Major	0.7	1798	2000	2005	0.8	2055
West/Brandt Foundation	CO-0035971	Minor	0.014					

Table 15 Bear Creek Watershed Annual Poundage Allocations

Facility	Pounds per year	
	1996	Control Regulation
Evergreen Metropolitan District	529	1,500
West Jefferson County Metro District	528	1,500
Genesee Water and Sanitation District	339	1,015
Town of Morrison	38	600
Kittredge Sanitation and Water District	130	240
Forest Hills Metropolitan District	80	80
Jefferson County Schools - Conifer High School	0	125
Conifer Center Sanitation Association	3	40
West/Brandt Foundation - Singing River Ranch	4	30
Mary Ann Gallagher - Brook Forest Inn	5	5
Bear Creek Development Corp. - Tiny Town	5	5
Jefferson County Schools - Outdoor Lab School	0	5
Bear Creek Cabins (Davidson Lodge)	2	5
Geneva Glen	0	5
Reserve Pool	100	100
Total	1,763	5,255

Big Dry Creek Watershed

Status of total maximum daily load allocation program

Big Dry Creek Partnership

The Big Dry Creek Watershed was a portion of the South Platte Urban Watershed, which includes Standley Lake, the tributary area to Standley Lake and the Big Dry Creek drainage. A separate watershed was formed based on the South Platte Urban Watershed TMDL assessment process (Figure 8). The water quality characterization and the predictive receiving and watershed models have shown this watershed as hydrologically distinctive from the remainder of the urban watershed.

No established watershed TMDLs

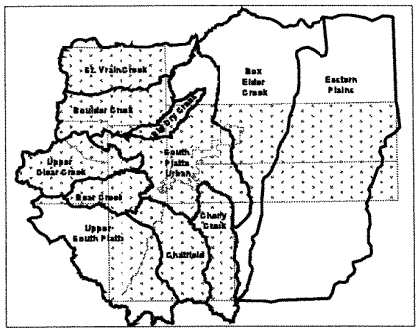
The Big Dry Creek Watershed originates in unincorporated Jefferson County near the mouth of Coal Creek Canyon and drains easterly across Rocky Flats, where several tributaries form, including Walnut Creek, Woman Creek and Upper Big Dry Creek. The flow in Big Dry Creek is heavily regulated by releases from Standley Lake and wastewater treatment facility discharges. Below Standley Lake, Big Dry Creek flows in a northeasterly direction to its confluence with the South Platte River near Fort Lupton in Weld County.

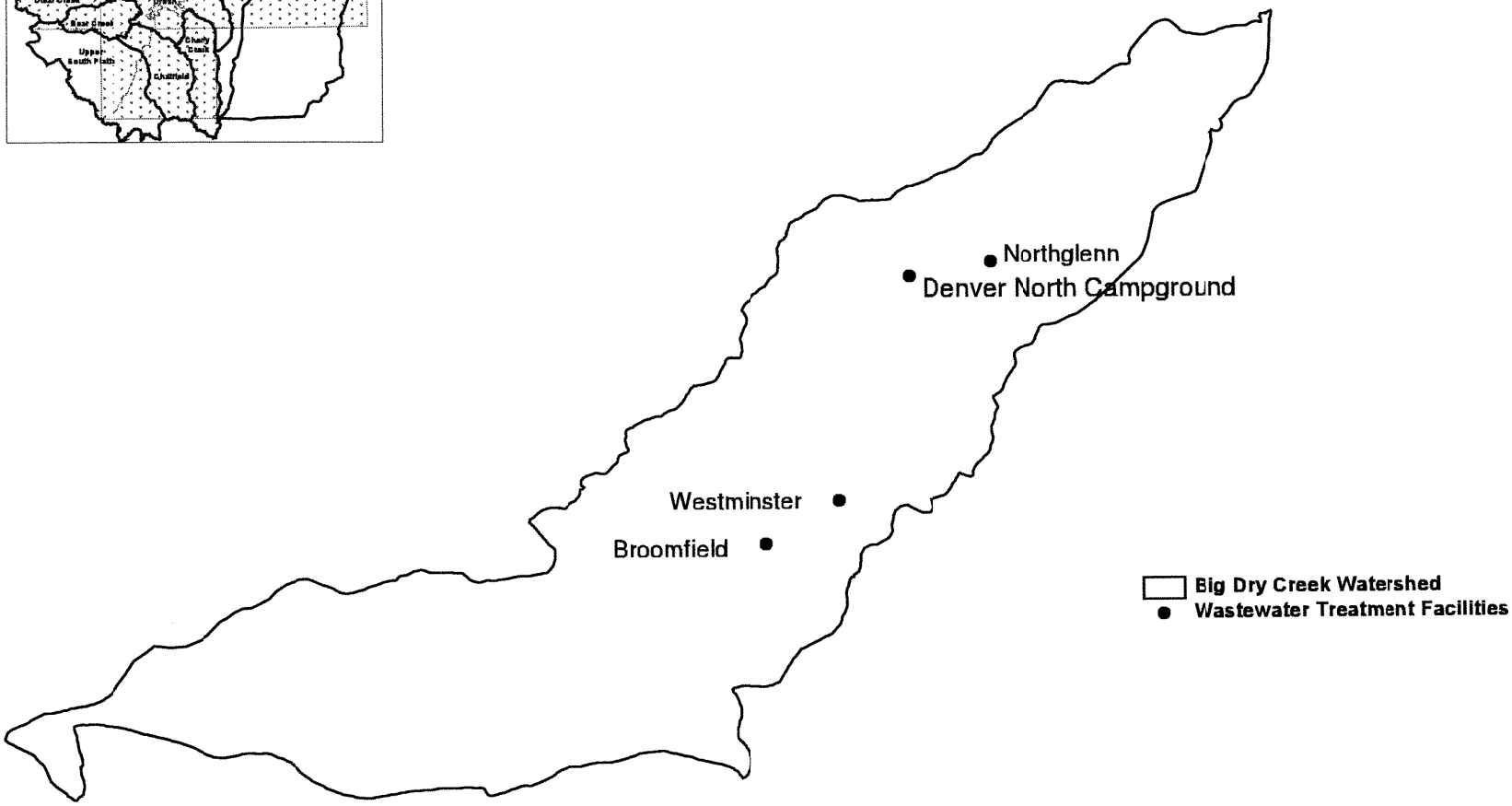
Significant portions of the watershed are currently undergoing rapid urban development, transitioning from predominantly agricultural uses to include a mixture of residential, commercial and industrial uses. The total drainage area at the confluence is approximately 110 square miles with a 42-mile length. Municipal and unincorporated county areas within the watershed boundaries include unincorporated Jefferson (21%), Westminster (20%), unincorporated Weld (18%), unincorporated Adams (16%), Broomfield (15%), Thornton (5%), Arvada (3%) and Northglenn (2%). Minor portions of Superior, Federal Heights and unincorporated Boulder County make up the remainder.

The Standley Lake cities (Northglenn, Thornton and Westminster) continue to be concerned with the protection of Standley Lake as a water supply for about 250,000 people in the northwest quadrant of the Denver area. The cities have actively studied Standley Lake water quality from 1980. The focus of these studies has been on the impacts from nutrients resulting from wastewater discharges and nonpoint source pollution. Protection efforts include removing stormwater flows from the canals carrying water from Clear Creek to Standley Lake. Other efforts include negotiating with parties in the Clear Creek Watershed to identify alternatives for reducing impacts from growth within the Clear Creek Watershed. An evaluation of nutrient control alternatives has been done for Standley Lake, along with involvement in water rights augmentation and exchange applications.

After requesting a hearing on nutrient standards before the Water Quality Control Commission in 1993, the cities negotiated the *Clear Creek Watershed Management*

Figure 8
Big Dry Creek Watershed





Agreement with numerous parties in the Clear Creek and Big Dry Creek drainage areas. The parties to the agreement introduced a narrative standard for Standley Lake, which was adopted by the Colorado Water Quality Control Commission in 1994 calling for the reservoir to be maintained in a mesotrophic state. Further discussion of the *Clear Creek Watershed Management Agreement* is provided in the Upper Clear Creek Watershed section. The location of Standley Lake within the increasingly urbanized Denver metropolitan area has made protection of this water supply from growth impacts of the utmost importance to the cities and makes the task of protecting the lake increasingly more difficult.

The South Platte Urban Watershed TMDL assessment process has encouraged the formation of a Big Dry Creek Watershed Association. A new watershed association has been formed and it received a grant from EPA to establish the program. The Big Dry Creek Watershed Association is a voluntary association of entities. The association has dedicated resources to develop a sound scientific understanding of water quality, flow, stream aquatic life and habitat conditions in the Big Dry Creek Watershed. The two primary purposes of the association are:

1) to be an environmentally responsible decisionmaking group with regard to land and stream uses; and

2) to identifying measures to improve and protect stream conditions.

The association will be responsible for water quality management within the watershed, including water quality characterizations and monitoring. Representatives from the Rocky Flats tributary area will be participants in the association and responsible for characterizing potential parameters of concern originating from the Rocky Flats area. Association members, along with other interested stakeholders, have initiated an evaluation of the chemical, physical and biological components of Big Dry Creek.

From a water quality modeling perspective, the receiving and watershed models developed for the South Platte Urban Watershed TMDL assessment process will continue to link with the Big Dry Creek Watershed as a major source to the South Platte River. Future phases of the South Platte Urban TMDL process will continue coordination efforts with the new association. However, TMDL decisions affecting the Big Dry Creek Watershed will be the responsibility of the new association and not the South Platte Urban Watershed Steering Committee. The Big Dry Creek Watershed Association is expected to work cooperatively with both the South Platte Urban Watershed Steering Committee and the Upper Clear Creek Watershed Association as part of any TMDL processes.

Management agencies

Table 16 lists the management and operating agencies in the Big Dry Creek Watershed (Figure 8). The management agencies include the Cities of Broomfield, Northglenn and

Westminster. The two existing operating agencies are Rocky Flats and Denver North Campground. The technical appendices to the *Clean Water Plan* contain detailed information about the wastewater treatment facilities and water quality assessments. Technical appendices will be maintained on an as-needed basis to reflect management agency activities.

The Big Dry Creek Partnership, which includes the cities of Broomfield, Northglenn and Westminster and the Rocky Flats Environmental Technology Site (Rocky Flats), started the Big Dry Creek Watershed Association. These four entities discharge wastewater into Big Dry Creek and they have been heavily involved in monitoring stream conditions for many years. The three cities have worked together since 1988 to monitor stream conditions in Big Dry Creek from Standley Lake to the confluence with the South Platte. Rocky Flats has intensively monitored stream conditions in the reach of Big Dry Creek from its headwaters to Standley Lake.

The association is open to those interested in cooperatively working toward understanding and prioritizing efforts to improve watershed conditions. In addition to the initial four partnership members, representatives of the City of Thornton, City of Arvada, the Natural Resources Conservation Service, the Colorado Division of Wildlife, Denver Regional Council of Governments, the Colorado Department of Public Health and Environment, the District Two water commissioner, the U.S. Environmental Protection Agency and others are also participating in the association. The association hopes to expand to include representatives of community groups, schools, farmers, developers, and other businesses and industries.

Wastewater management plans

The City of Broomfield is a major existing municipality in the Big Dry Creek Watershed. The City of Broomfield wastewater treatment facility has a design capacity of 5.4 MGD with an expected expansion to 8.0 MGD before 2020. The treatment facility is currently at 80 percent of capacity and the need for an expansion is projected by the year 2000. Broomfield has initiated a new utility plan, which will evaluate the projected growth and wastewater needs through 2020. Substantial commercial development is anticipated to increase the needed capacity well beyond 8 MGD before 2020.

Broomfield has planned to reclaim its wastewater effluent for many years. Initially, the city received a conditional water decree in 1983 (case number W-8772-77) to capture up to 5 cubic feet per second of wastewater effluent and apply the water to public areas within the city. The city has completed its *Great Western Reservoir Replacement Project,* which replaced the Clear Creek-based drinking water system with water supplied from the Windy Gap project. The Great Western Reservoir will no longer be used by the City of Broomfield as a water supply and the water treatment plant will no longer treat water for potable use.

The Broomfield wastewater reclamation project will utilize both the reservoir and treatment plant. The reclamation project entails building a pipeline from the wastewater facility to the water treatment plant. The converted water treatment plant will be used to provide tertiary treatment and provide nonpotable water for irrigation purposes. The reservoir will be used for storage of wastewater effluent in winter months to provide an adequate summer supply. Initially the reclamation project will provide 2,100 acre-feet of reuse water. The Water Quality Control Commission has revised the standards in Great Western Reservoir to accommodate the reclamation project. Construction is projected for 2001 with the system fully operational by 2003.

If the Metro District and Northglenn develop a contract to use Northglenn excess capacity, then Northglenn and the Metro District shall be designated as the joint management agency for these areas and Northglenn shall be designated the operating agency. If a contract is not concluded within a timeframe that assures Thornton of service to meet its contractual commitments, then the Metro District will serve Thornton through the Central Facility. Thornton is authorized to construct the necessary facilities, which would enable the Metro District to provide sewer service through the Central Facility and/or the Northglenn facility.

The Northglenn service area is in the middle portion of the Big Dry Creek Watershed, while the treatment facility is located at the northern extent of the watershed within Weld County. The wastewater is almost exclusively reused by the agricultural industry. The facility capacity is rated at 6.5 MGD, which is almost 2.5 MGD larger than Northglenn will need by the year 2015. This excess capacity could be used to serve a larger service area than the present Northglenn service area.

The service area of Westminster is also a major existing urban development in Big Dry Creek Watershed. The City of Westminster wastewater treatment facility has a design capacity of 7.5 MGD. The Westminster wastewater treatment facility is projected to require a capacity expansion to 12.5 MGD before 2020 to serve growth within its service area. The City of Westminster should complete a new utility plan, which evaluates the projected growth and wastewater capacity needs.

In 1996, the City of Westminster determined the most cost-effective and best alternatives for development of the Westminster Reclaimed Water System. The facility plan includes site identification, water quality issues, reuse components, estimated costs and financing, and a public information program. The reuse plant will obtain secondary effluent from the Big Dry Creek Water Reclamation Facility and treat it using coagulation, flocculation, filtration and disinfection.

The reclaimed wastewater will then be distributed by a specifically designated piping system to various locations throughout the city. The reuse system will be one of the larger examples of conservation of water resources in the State of Colorado and the western United States. It will ultimately deliver up to 3,000 acre-feet of reclaimed water to irrigate large public turf areas such as golf courses and parks, and provide water for

lakes, ponds and wetlands. Design of all system components began in May 1997 and the initial 1,100 acre-feet phase of the project should be in service by the spring of 2000.

Table 16 Big Dry Creek Watershed Wastewater Facilities

Management (M) and Operating Agencies	Permit	Facility Size	Design Capacity		Estimated Date at		2020 Needed Capacity	
			Hydraulic (MGD)	Organic (lbs/day)	80% Capacity	95% Capacity	Hydraulic (MGD)	Organic (Lbs/day)
Broomfield, City of (M)	CO-0026409	Major	5.4	10300	1998	2000	8	15260
Denver North Campground	CO-0035793	Minor	0.0105	17.8		2020		
Northglenn, City of (M)	CO-0036757	Major	13.1	227		2020		
Rocky Flats	CO-0001333	Major	0.5			2020		
Westminster, City of (M)	CO-0024171	Major	7.5	6.34	2000	2005	12.5	25850

Boulder Watershed

Status of total maximum daily load allocation program

Tri-Basin Workgroup

Wastewater treatment facilities in the Boulder Watershed (Figure 9) have wasteload allocation limits for ammonia-nitrogen. The allocations are incorporated into the specific permits. The *Clean Water Plan* has recognized for seven years that a more comprehensive wasteload allocation modeling effort is needed in the Boulder Watershed. The *Clean Water Plan* further recommends that a total maximum daily load (TMDL) be completed in the Boulder Watershed before any additional wastewater treatment facilities are recommended. The plan identified the Tri-Basin Workgroup as the institutional group of stakeholders to develop the TMDL for these watersheds.

Ammonia wasteload allocations in wastewater discharge permits

All identified data sources were researched and available data was tabulated into an electronic data base. Identified sample sites were mapped and appropriate data was linked to these sites. A watershed map with sampling locations was developed for planning purposes. A schematic of the watershed hydrology was developed for potential modeling assessment.

Evaluating the available dataset suggests that sufficient chemical data is available to initiate a receiving water level TMDL study in both watersheds. Some additionally headwater source data and stream flow data gaps will be important to include in any future monitoring efforts. However, the amount and type of data does limit the choice of models. While there is a good amount of temperature, pH and ammonia data available, calibrating the model requires flow data. Only 28 percent of the samples included flow data. Although it would be possible to run a TMDL model with the available data, additional sampling sites would be useful to characterize the upper watershed regions.

Based on the available data, a receiving water model can be developed and run in a TMDL application. Output data from this modeling effort could be used to establish wasteload allocations for selected parameters. A new wasteload allocation is needed for ammonia in the watershed. Specifically, the QUAL2E and STREAMDO models incorporate the type of data that is available and provide information pertaining to the water quality of the stream of interest. The QUAL2E model can be run without any special customization, while the STREAMDO model will need to be developed for the watersheds. The wasteload allocation can establish appropriate limits for permitted facilities.

Since Boulder Creek segments 9 and 10 are included on the 1998 303(d) List, there is a need to initiate a TMDL process within the next two years. The parameters of concern are ammonia and aquatic life. All members of the Tri-basin work group should be involved in any TMDL effort. The completion of a TMDL process will require the

development of a watershed model, which can be used to characterize stormwater and nonpoint sources. By using a watershed inclusive dataset a more comprehensive study can be completed allowing for the most accurate water quality assessment for management purposes. The TMDL process should commence in the Boulder Watershed by June 1998 with a targeted completion of December 2000.

Management agencies

The designated management agencies in the Boulder Watershed, including the Coal Creek drainage are Boulder County, City of Boulder, City of Louisville, City of Lafayette, Town of Erie, Town of Nederland and Town of Superior (Table 17). Boulder County is the management agency for a number of smaller wastewater treatment facilities list in Table 17 as operating agencies. The technical appendices to the *Clean Water Plan* contain detailed information about the wastewater treatment facilities and water quality assessments. Technical appendices will be maintained on an as-needed basis to reflect management agency activities.

Operating and management agencies in the Coal Creek, Boulder and St. Vrain drainages and Weld County created the Tri-basin work group. This group has been responsible for developing any scope of services for water quality studies, providing a forum for water quality issues and disseminating regionally important water quality or other environmental information. Although the Tri-basin Work Group is not a designated management agency, the group is responsible for implementation of special studies. The Tri-basin Work Group assists DRCOG in the water quality assessment and wastewater management planning for the Boulder and St. Vrain watersheds.

Wastewater management plans

The City of Boulder's wastewater treatment facility ammonia removal (nitrification) system is complete. The Boulder wastewater treatment facility has been upgraded in recent years with the addition of nitrification processes as specified in the previous permit. The facility is rated to a capacity of 23 MGD as an annual average, which provides capacity through 2015. The new nitrification process is fully functional. The new process meets the seasonal permit limitations of 13 to 20 mg/R ammonia.

The City of Boulder has also begun a stream and riparian corridor restoration program on Boulder Creek. This alternative program is designed to improve water quality conditions in the stream, which will benefit the wastewater treatment facility. Improving temperature and pH conditions in Boulder Creek should make wastewater ammonia effluent limitations less restrictive. These stream improvements should reduce water temperatures, thereby reducing the downstream ammonia problems, which gives this stream segment a partially supporting status. The city will continue to make in-stream improvements as long as a direct benefit to the treatment facility can be shown. There is a water quality monitoring program associated with this restoration program.

The City of Louisville is one of four dischargers to Coal Creek, which also includes the City of Lafayette, the Town of Erie and the Town of Superior (Rock Creek Ranch). All four facilities will need expansions to serve 2020 populations. While these wastewater treatment facilities have ammonia limitations, these limits protect Boulder Creek rather than Coal Creek. The City of Louisville wastewater treatment facility design capacity is 2.6 MGD. The City of Louisville nonresidential wastewater has increased the needed capacity of the treatment facility by 0.50 MGD or about 20 percent of the facility capacity. The city has averaged a 4 percent annual increase in population with additional nonresidential flows expected in the near future. As a result, the projected facility capacity needed for 2020 is 4.2 MGD. The City of Louisville must complete a utility plan to confirm this capacity expansion.

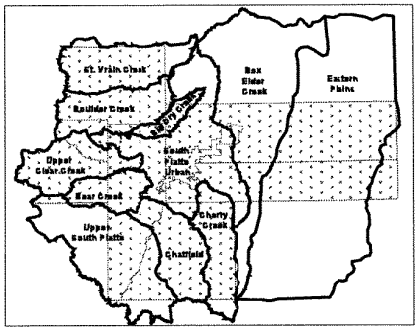
The City of Lafayette wastewater treatment facility has a design capacity of 2.80 MGD with a needed 2020 capacity of 4.4 MGD. The City of Lafayette is also in the Bullhead Gulch drainage basin, which is tributary to segment 9 of Boulder Creek. Wastewater generated by developments in the Bullhead Gulch drainage is presently pumped to the Lafayette treatment facility in the Coal Creek drainage. It is anticipated that 2.80 MGD of flow will be generated in the Coal Creel drainage with an additional 1.6 MGD of flow coming from the Bullhead Gulch drainage basin. The intermediate staging of the facility may be slightly altered as a result of the service area changes. Existing or planned wastewater conveyance and treatment systems are anticipated to be adequate.

The City of Lafayette has had preliminary discussions with the Town of Erie concerning a regional wastewater treatment facility, which could serve the Erie service area and the Bullhead Gulch drainage flows. This issue appears to be in the future and no action is anticipated within the next five years. If a regional facility is not realized, then Lafayette will pursue an independent treatment facility near the confluence of Bullhead Gulch and Boulder Creek or expand the Lafayette Coal Creek facility to accommodate all Lafayette flows. The City of Lafayette should incorporate this evaluation into a new utility plan before there is any expansion of the current treatment facility.

The Town of Superior is the management agency for the Rock Creek service area. The wastewater treatment facility built by Superior Metropolitan District No. 1 is permitted for 0.55 MGD. The facility has been designed to accommodate expansion to 2.2 MGD. There is capacity available to the Town of Superior at this facility. The facility is designed to reuse most effluent. The wastewater service agreement between the City of Louisville and the Town of Superior has been terminated.

The Town of Erie is located in both Boulder and Weld counties. The Town of Erie is experiencing growth and expansion of its service area. Boulder County and the City of Lafayette were concerned about potential service area expansions. Planning issues have been resolved through a cooperative process involving the Town of Erie, Boulder County, the City of Lafayette, the City of Broomfield, the North Front Range Water Quality Planning Association and DRCOG. The technical appendices to the *Clean Water Plan* detail the wastewater management strategies for the Town of Erie.

Figure 9
Boulder Creek Watershed



Alex Dawson School
Erie
Boulder
Boulder Mountain Lodge
PSCO-Valmont
Red Lion Inn
Dietrich Standard Corp
Lafayette
Delta Environmental
Micro Motion
Sacred Heart of Mary
Louisville
Nederland
San Soucci
Superior
Lake Eldora

Boulder Creek Watershed
Wastewater Treatment Facilities

N

0 3 6 Miles

DRCOG

Table 17 Boulder Creek Watershed Permitted Treatment Facilities

Management (M) and Operating Agencies	Permit	Facility Size	Design Capacity		Estimated Date at		2020 Needed Capacity	
			Hydraulic (MGD)	Organic (lbs/day)	80% Capacity	95% Capacity	Hydraulic (MGD)	Organic (lbs/day)
Alexander Dawson School	CO-0045021	Minor	0.3	49			0.23	
Boulder Mountain Lodge	CO-0040819	Minor	0.0045	13				
Boulder, City of (M)	CO-0024147	Major	20.5	29065	2010			
Erie (M)	CO-0021831	Major	0.3	460	2015			
Greenbriar Restaurant	Site Application	Minor	0.006					
Lafayette, City of (M)	CO-0023124	Major	2.8	5840	2000	2005	2.8	5840
Lake Eldora W&SD	CO-0020010	Minor	0.03	333	1999			
Louisville, City of (M)	CO-0023078	Major	2.6	5963	2000	2003	4	9174
Mountain Shadows Montessori	Site application	Minor	0.04		2015			
Nederland, Town of (M)	CO-0020222	Major	0.189	277				
PSCO-Valmont	CO-0001112	Minor	0.045		2015			
Red Lion Inn	CO-0027260	Minor	0.009	19				
Sacred Heart of Mary	CO-0045276	Minor	0.437	9.1				
San Lazaro Mobile Home Park	CO-0020184	Major	0.001	3				
San Soucci Mobile Home Park	CO-0020061	Minor	0.018					
Superior (Metro District) (M)	CO-0043010	Major	0.55	1400	2000	2002	2.2	4600

The Town of Erie finalized a 201 facility plan in March 1997. This plan is in compliance with provisions adopted by the DRCOG Board in 1995 and as amended in 1997. The facility plan describes the utility service provisions, including the overlapping management between the DRCOG region and the North Front Range Water Quality Planning Association region. The future wastewater flow projections for the town show the need for a new wastewater treatment facility located along Boulder.

An interim treatment facility with a design capacity of 0.6 MGD is being constructed adjacent to the current site to allow additional time to plan for future facility. The interim facility can be constructed for 3.6 million dollars and provide a minimum of five years of wastewater capacity. The planning issues needing further analysis include a joint-use regional facility (Lafayette and/or Broomfield and Erie), TMDL allocations for Boulder Creek, improved estimates of revenue generation, administrative and regulatory requirements, and the siting of a new facility.

The Town of Nederland completed an expansion in 1991. The facility is not experiencing problems meeting effluent limits. The design capacity is 0.189 MGD. The facility could remain near 90 percent capacity for a number of years due to little or no growth and development. However, the facility should still require an additional expansion to meet the projected 2010 capacity. A potential future water quality problem is associated with the Nederland treatment facility effluent being discharged into Barker Reservoir, which is designated as a drinking water system. Water quality monitoring in Barker Reservoir should be done to establish baseline conditions. The Town of Nederland needs to develop a utility plan to address this issue. One option for the town is to move the wastewater treatment facility to a location downstream of Baker Reservoir.

A minor wastewater treatment facility has been approved for the Public Service Company (PSC) Valmont Station. The treatment system involves the use of natural biological treatment of septic tank effluent utilizing two constructed wetland systems: one designed to treat a flow of 3,000 gallons per day and the second system designed to treat a flow of 1,500 gallons per day. The first and larger of these wetland systems consists of a duplex sewage grinder lift station, which pumps effluent to a septic tank, then to a second duplex station, and subsequently to the constructed wetland. Effluent from the wetland is discharged into Hillcrest Reservoir.

In the Boulder Watershed, there are 10 other wastewater treatment facilities with NPDES permits (Table 17): Alexander Dawson School (0.3 MGD), Boulder Mountain Lodge (0.0052 MGD), Greenbriar Restaurant (0.006 MGD, site application review), Lake Eldora Water and Sanitation District (0.03 MGD), Red Lion Inn (0.009 MGD), San Lazaro Mobile Home Park (0.13 MGD, which classifies this facility as major), San Soucci Mobile Home Park (0.018 MGD), Mountain Shadows Montessori, Boys and Girls Club, Dakota Ranch (0.001 MGD), Gold Lake Ranch (0.0054 MGD) and Seventh Day Adventist (0.04 MGD). Recent changes in permits for these facilities will be reflected in

the *Clean Water Plan*. Any water quality modeling done in the Boulder and/or St. Vrain Watersheds should consider these facilities.

There are two other potential wastewater dischargers in Boulder County: the communities of Ward and Allenspark. The Town of Ward has been experiencing problems with individual septic disposal systems. The Allenspark facility is proposed to be a regional facility and does not have an approved site application. An Allenspark facility will need to be amended into the *Clean Water Plan* before a site application can be processed by DRCOG. Boulder County is the management agency for Allenspark and it will be the county's responsibility to forward the *Clean Water Plan* amendment request. If wastewater treatment facilities are built at these locations, they should then be included in any water quality modeling.

Box Elder and Eastern Plains watersheds

Status of total maximum daily load allocation program

Eastern plains communities

Generally, surface waters are intermittent. Stormwater-related nonpoint source runoff into surface waters is not limiting the designated uses of downstream receiving waters. The existing data indicates that the numerous intermittent streams in the plains watersheds do not experience water quality excursions exceeding adopted water quality standards. Therefore, no TMDLs are needed in the eastern plains watersheds at this time. Additional water quality monitoring is needed to better assess water quality trends.

No required TMDLs

Service areas that utilize well water exclusively must be sensitive to residential, industrial and commercial activities and growth, which could cause contamination or overuse of the water in the aquifers. The aquifers are already experiencing water table reductions at measurable rates. Generally, the drinking water aquifers are categorized as bedrock aquifers, which means there is very little water supply replenishment taking place. The Denver aquifer is tapped by all four residential areas. Bennett runs wells as deep as 700 feet. The farther east of Bennett that wells are sunk, toward Strasburg, Byers and Deer Trail, the shallower the aquifers and wells tend to be. This is because the Denver aquifer in these areas is constrained and closer to the surface.

The Town of Deer Trail expressed its concern over the possibility of agricultural pollutants seeping into drinking wells. For the deep wells, this possible contamination is probably not a result of surface water seepage into the deeper aquifer. Contaminated surface water would not easily penetrate the constrained portions of the deeper aquifers in the region. There is potential for wellhead contamination due to improper well construction. A wellhead protection program should be considered for the Town of Deer

Trail. In addition, Deer Trail should evaluate its chlorination practices and flushing procedures for *dead-ends* in its distribution system.

Management agencies

The Box Elder and eastern plains watersheds (Figures 10 and 11) are located in portions of Adams and Arapahoe counties. The designated management agencies are the City of Aurora jointly with the Metro Wastewater Reclamation District, the Town of Bennett, the Town of Deer Trail, the Town of Lochbuie, the Adams County Water Quality Association, Adams County and Arapahoe County (Tables 18 and 19). The eastern plains watersheds also include the Strasburg Water and Sanitation District and the Byers Water and Sanitation District. The management and operating agencies in the eastern plains watersheds are listed in Tables 18 and 19. Adams and Arapahoe counties are the designated management agencies for the operating agencies.

Wastewater management plans

Nine wastewater treatment facilities are located in the eastern plains area and include: Watkins, Central Adams North, Bennett, Byers, Town of Deer Trail, Deer Trail Rest Stop (Colorado Department of Transportation), Strasburg, Air Park, and OEA-Incorporated. The communities of Bennett, Byers, Deer Trail and Strasburg all discharge into segment 2 tributaries to the South Platte River. The proposed Box Elder/Front Range Airport treatment facility will be developed and operated cooperatively by the City of Aurora and the Metro Wastewater Reclamation District.

Presently, no new wastewater treatment facilities are expected to be required at any other urbanized areas in either the Kiowa or Bijou drainages and, if presented, each will be reviewed on a case-by-case basis. The technical appendices to the *Clean Water Plan* contain detailed information about the wastewater treatment facilities and water quality assessments. Technical appendices will be maintained on an as needed basis to reflect management agency activities.

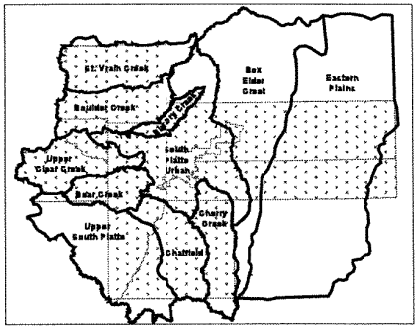
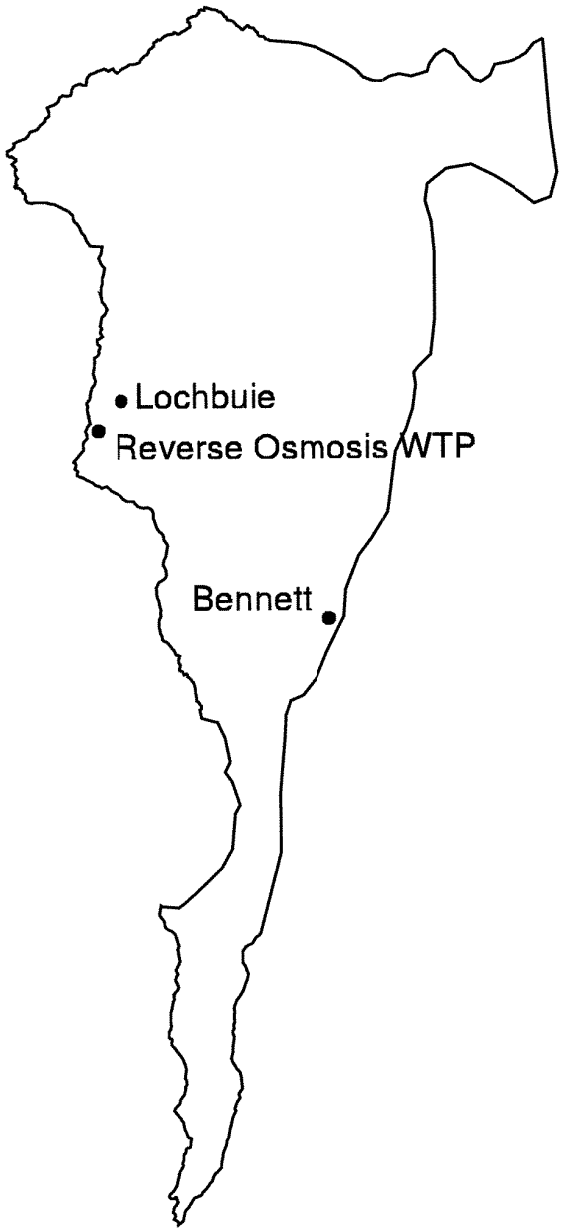


Figure 10
Box Elder Creek Watershed



Box Elder Creek Watershed
Wastewater Treatment Facilities

N

0 5 10 15 20 Miles

DRCOG

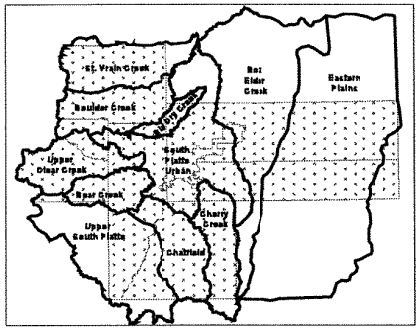
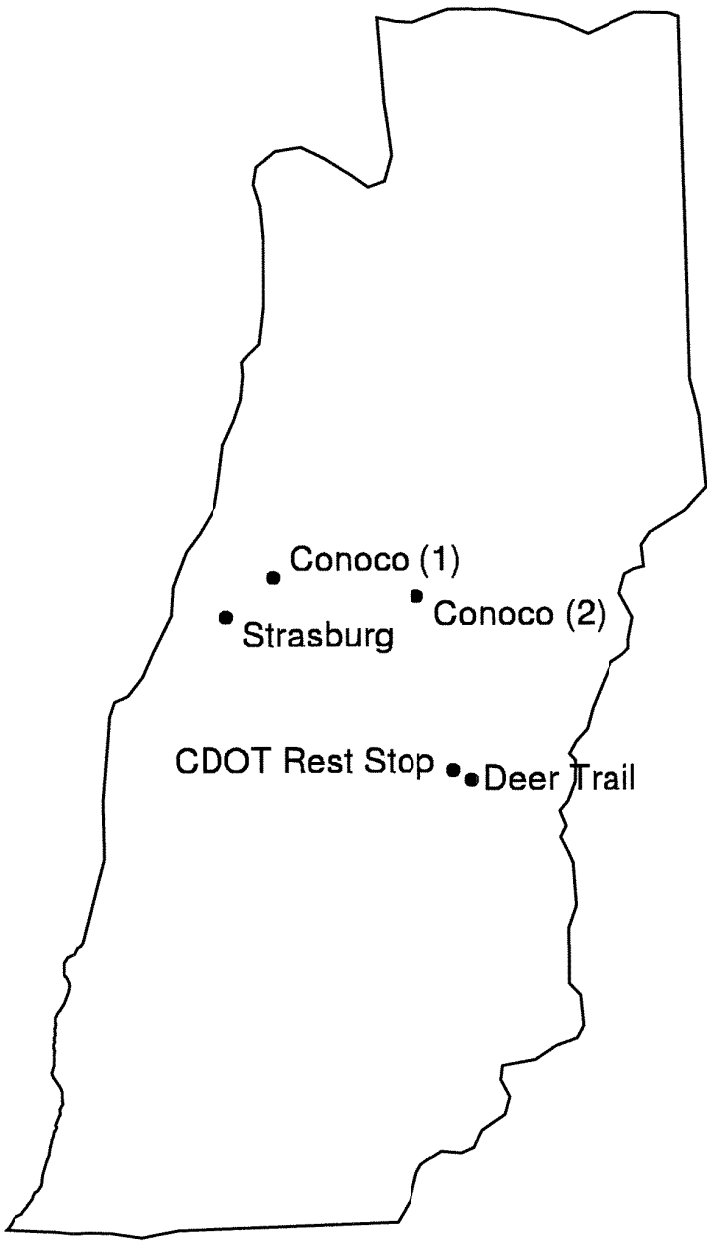


Figure 11
Eastern Plains Watersheds



Eastern Plains Watersheds
Wastewater Treatment Facilities

N

0 5 10 Miles

DRCOG

Table 18 Box Elder Creek Wastewater Treatment Facilities

Management (M) and Operating Agencies	Permit	Facility Size	Design Capacity		Estimated Date at		2020 Needed Capacity	
			Hydraulic (MGD)	Organic (lbs/day)	80% Capacity	95% Capacity	Hydraulic (MGD)	Organic (lbs/day)
Air Park	CO-0042323	Minor	0.25	450				
Bennett, Town of (M)	CO-0025615	Major	0.42	722	2005	2010		
Box Elder / Front Range (Watkins)	Proposed	Major	0.66					
Central Adams North	Proposed	Minor						

Table 19 East Plains Watershed Wastewater Treatment Facilities

Management (M) and Operating Agencies	Permit	Facility Size	Design Capacity		Estimated Date at		2020 Needed Capacity	
			Hydraulic (MGD)	Organic (lbs/day)	80% Capacity	95% Capacity	Hydraulic (MGD)	Organic (Lbs/day)
Byers	Co-0029769	Major	0.60					
Deer Trail Rest Area (CDOT)	COG-630042	Minor	0.006					
Deer Trail, Town of (M)	CO-0044628	Major	0.06171	98.6				
First Union Management Inc.	COG-630039	Minor	0.006					
Strasburg Water & Sanitation	COG-630050	Major	0.02					
Strasburg	CO-0037176	Major	0.06		2005			

Chatfield Watershed

Status of total maximum daily load allocation program

Chatfield Watershed Authority

The Chatfield Watershed contains Plum Creek, Deer Creek and the portion of the South Platte River from the outlet of the Strontia Springs Reservoir to Chatfield Reservoir (Figure 12). The Chatfield Watershed includes those areas tributary to the Plum Creek drainage or directly tributary to Chatfield Reservoir. The water quality monitoring program is specified in the Chatfield Basin Control Regulation as adopted by the Colorado Water Quality Control Commission. The watershed water quality monitoring is designed to characterize Chatfield Reservoir and major inputs to the reservoir. The control regulation is an EPA and state-accepted TMDL for the Chatfield Watershed.

Approved total phosphorus TMDL for Chatfield Watershed

Water quality data was originally collected as part of an intensive one-year *Chatfield Reservoir Clean Lake Study* (DRCOG 1984). A generally continuous collection of surface and groundwater quality data has been done in the Chatfield watershed and reservoir beginning in 1982. Data collection has included specific chemical, physical and biological parameters. Monthly and bimonthly data collection has been taken at up to 28 sites by various agencies. An extensive water quality dataset continues to be collected by the authority.

It is apparent from the monitoring data that the lake does not respond as predicted by the models used in the original Clean Lake Study. Neither the relationship of basin loading to in-lake levels of phosphorus nor the relationship of phosphorus and chlorophyll appear to be valid. The phosphorus to chlorophyll α relationship is an issue of concern to the authority. The authority will also be researching alternative models for predicting chlorophyll levels.

Based on selected trophic status indicators and generally combining the various approaches to characterizing reservoir quality, Chatfield Reservoir ranges from mesotrophic to eutrophic. Depending on which set of trophic indicators is selected, the reservoir now tends to be on the mesotrophic-eutrophic boundary. The probability of having the reservoir in a hypereutrophic state is less than 5 percent, while the probability of a mesotrophic reservoir is about 30 percent. The total phosphorus trophic indicator shows a decline in concentrations from 1987 to 1996. However, not all indicators show a similar clear trend over time. Therefore, the trophic status of the reservoir appears to be stabilized under the existing loading conditions.

In 1988, DRCOG completed a study for the Chatfield watershed which addressed the water quality management needs. The watershed is expected to grow rapidly over the next 25 years, resulting in additional loads to the receiving waters: Plum Creek and Chatfield Reservoir. The study recommended a system of eight major wastewater

treatment facilities and a nonpoint control program to deal with the phosphorus and ammonia problems in the watershed.

The wasteload allocation program for phosphorus is based on the 0.027 mg/R standard for Chatfield Reservoir, adopted by the WQCC. Using an in-lake model, it was possible to define the total annual load of phosphorus, which would protect the reservoir standard. The present phosphorus load into the reservoir is largely the result of the stormwater runoff and the baseflow in the South Platte River, Plum Creek and other tributaries. As conditions change and more development occurs, treated wastewater will add more phosphorus. The increase in developed land will also create an increase in the quantity of stormwater, which reaches the reservoir. As a result, the combination of loads from point and nonpoint sources is expected to become the dominant source of annual reservoir phosphorus loading.

With a set of facilities defined, the effluent limits for pollutants other than phosphorus could be determined. The stakeholders elected to apply an equal treatment criterion for all dischargers to Plum Creek. Two pollutants will require better than secondary treatment: ammonia and nitrate. More water quality data is needed before the total ammonia limit in the stream can be determined. Due to the relationship between the required effluent ammonia limit and subsequent nitrate concentrations from ammonia conversion, effluent nitrate levels must be determined after the total ammonia limit is established.

Management agency

The Chatfield Watershed Authority is the designated water quality management agency for Chatfield Watershed (Figure 12). The members of the authority include Douglas and Jefferson counties, cities, sanitation districts and industrial dischargers located within the Chatfield portion of these counties. The authority added the City of Littleton, due to its annexation of the Chatfield Green development. The operating agencies for the Plum Creek Watershed are listed in Table 20.

Table 20 also identifies the wastewater treatment facilities located in the Upper South Platte River Watershed. Treatment facilities in the upper watershed discharge into the South Platte River, which is tributary to Chatfield Reservoir. While some of these facilities are not covered by the *Clean Water Plan*, they are important contributors to the nutrient load reaching the reservoir.

The Chatfield Watershed Authority developed a five-year (1997-2002) nonpoint source priority program which will be incorporated into future work programs. The elements of this five-year program were adapted from the *Nonpoint Source Compliance Report: Summary of the Nonpoint Source Management Program for the Chatfield Watershed* (Chatfield Basin Authority 1995). The report lists potential types of nonpoint source program elements useful for watershed management including a variety of planning programs along with structural and nonstructural best management practices. Many of the planning programs and nonstructural practices are multiphased and will require

several years to implement. Even structural practices require years of monitoring to assess function and effectiveness. The report prioritizes projects and assigns estimated costs for use in annual budgeting.

The authority members developed and accepted a new memorandum of agreement between Douglas County, Jefferson County, the Town of Castle Rock, the Town of Larkspur, the City of Littleton, Perry Park Water and Sanitation District, Castle Pines Metropolitan District, Roxborough Park Metropolitan District, the Plum Creek Wastewater Authority and Lockheed Martin Astronautics, which created the *Chatfield Watershed Authority*. The authority members entered into intergovernmental agreements for the purpose of providing service or performing functions which they can perform individually, but are more economical when done as a collective group.

Members who have jointly signed the *Chatfield Watershed Authority Memorandum of Understanding* have the power under Colorado law to develop, recommend and adopt provisions for water quality management within the Chatfield Watershed consistent with the regional *Clean Water Plan*. The Chatfield Watershed Authority will provide an integrated, holistic water quality management and implementation program to protect or attain established beneficial uses of waters within the Chatfield Watershed.

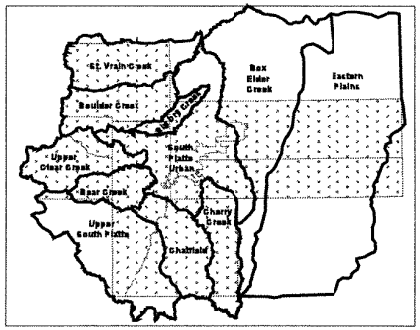
Wastewater management plans

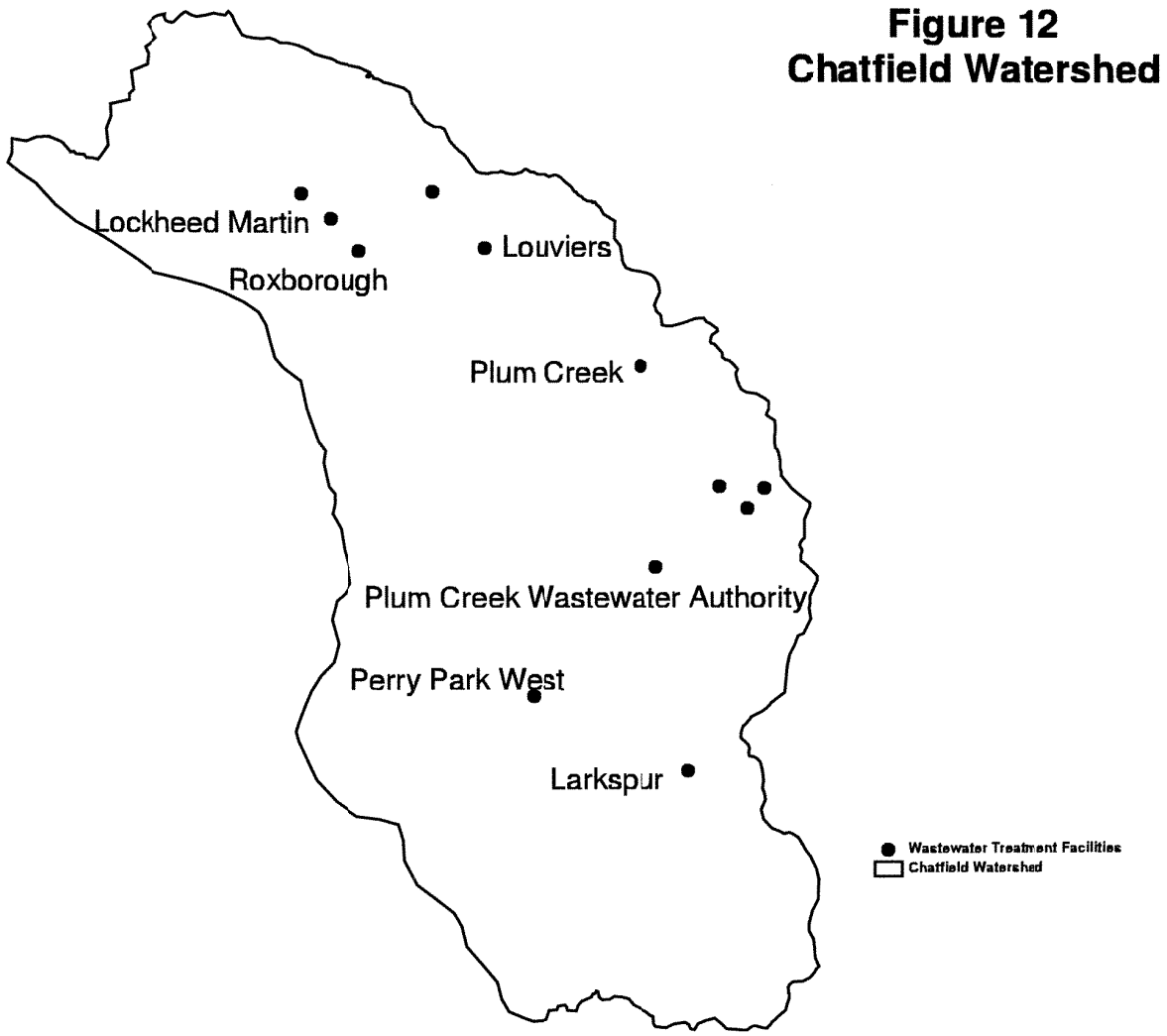
The technical appendices to the *Clean Water Plan* contain detailed information about the wastewater treatment facilities and water quality assessments. Technical appendices will be maintained on an as-needed basis to reflect management agency activities.

Existing dischargers into segment 10 include Perry Park Water and Sanitation District (two facilities), Larkspur, Castle Rock and Castle Pines. Roxborough Park Metropolitan District and Lockheed Martin Astronautics discharge into segment 6 of the South Platte River. The Plum Creek Wastewater Authority, comprised of the Town of Castle Rock, the Castle Pines Metropolitan District and the Castle Pines North Metropolitan District, owns and operates a wastewater treatment system on East Plum Creek. A portion of the Castle Pines/Castle Rock service area is in the Cherry Creek Watershed: Mitchell and McMurdo drainage basins. No wastewater service to these service areas is anticipated within the next five years.

The point source annual wasteload allocation of total phosphorus for discharge into the Chatfield Watershed is limited to 7,358 pounds per year. In 1996, the point sources produced a total annual discharge of 1,664.8 pounds of phosphorus (23 percent of the total allocation) as shown in Table 21. All wastewater treatment facilities comply with the control regulation poundage allocations.

Figure 12
Chatfield Watershed





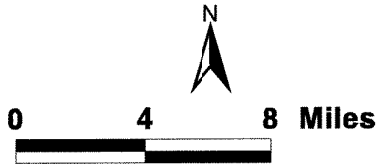


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Table 20 Chatfield Watershed Wastewater Treatment Facilities

Management (M) and Operating Agencies	Permit	Facility Size	Design Capacity		Estimated Date at		2020 Needed Capacity	
			Hydraulic (MGD)	Organic (lbs/day)	80% Capacity	95% Capacity	Hydraulic (MGD)	Organic (Lbs/day)
Castle Pines Metro	CO-0038547	Major	2.3	4220				
Larkspur, Town of	CO-0035891	Major	0.075	150				
Lockheed Martin	CO-0001511	Major	0.55					
Louviers, Town of	CO-0027359	Minor	0.04	95.8	2010	2015	0.04	95.8
Perry Park East (Sage Port)	CO-0043044	Major	0.1	317				
Perry Park West (Waucondah)	CO-0022551	Major	0.32	855	2002	2003	0.1	8550
Plum Creek Wastewater Authority	CO-0020265	Minor	0.9	1800	2001	2003	12.9	27200
Roxborough Park Metro District	CO-0041645	Major	0.6	0.306				

Table 21 Phosphorus Pounds Reported by Chatfield Watershed Facilities

Wastewater Facility	Average Annual Phosphorus (pounds)	Total Annual Pounds
	Reported 1996	Allocated
Plum Creek Wastewater Authority	921	4,256
Larkspur	0	231
Lockheed Martin Astronautics	338	1,005
Perry Park, Waucondah	70.0	365
Perry Park, Sage Port	17.3	73
Roxborough Park	307	1,218
Louviers Mutual Service Company	11.5	122
Summit County	Not Used	88
TOTAL	1,664.8	7,358.0

The capacity of the Plum Creek Wastewater Authority facility is 3.55 MGD. No other projected facility upgrades are expected within the next seven years. Wastewater management changes as part of the system upgrade consistent with recommendations from the management agency were incorporated into the regional *Clean Water Plan*. There were no changes to the facility's operation, maintenance or management in 1997. The facility experienced no compliance problems in 1997, which extends the compliance record to seven years.

The wastewater flow generated at the Bell Mountain Ranch District may be transmitted by gravity to the Plum Creek Wastewater Authority. An intergovernmental agreement has been developed between the district and the operating and management agency. However, the district has begun development using individual sewage disposal systems for waste disposal on larger lots. The service area is still recognized as part of the Plum Creek Wastewater Authority. The Chatfield Watershed Authority should evaluate this service area and make any appropriate recommendations for incorporation in the *Clean Water Plan*.

The two remaining facilities are consolidations of existing and previously planned facilities in the Castle Rock and Larkspur areas. The plan shows a regional facility at the site of the existing Castle Pines facility to serve the Castle Pines and Castle Rock

service areas. This facility and the existing Castle Rock facility are now operated as one system by the Plum Creek Wastewater Authority. The cost analysis used in the basin study suggested that service to this area by one facility would be the least expensive for Castle Rock residents. Flows from the McMurdo and Mitchell drainage basins in the Cherry Creek Basin will be treated at the Plum Creek Wastewater Authority. The phosphorus allocation for these two sub-basins is still shown as part of the Cherry Creek system, assuming that the effluent would be returned to that basin. Some of this effluent may be used for land application in the Chatfield Basin. If so used, that portion of the 192 pounds of phosphorus will need to be accounted for within the overall limits.

The Plum Creek Wastewater Authority has consolidated the operations of the former Castle Rock and Castle Pines facilities and improved the operations of the Castle Pines facility. The Castle Rock facility has been inactivated, but remains available for future service. The authority has signed a service agreement with the Silver Heights Sanitation District, which finalized closure of that district's wastewater lagoon.

Minor changes were made to the Lockheed Martin treatment facility in 1997. Mixers were added to the sanitary sludge digester to enhance treatment. Remote monitoring of lift stations was brought on-line. A planned upgrade within the next five years is to add a chemical feed system to facilitate separation of domestic and industrial wastewater. There were no significant changes to the operation, maintenance or management of the facility in 1997.

In the Larkspur area, the plan shows a single facility serving both the Larkspur service area and the East Perry Park service area. Two existing facilities are in this service area: the Larkspur lagoon and the Sage Port facility. These facilities are recognized as interim systems by the *Clean Water Plan* with 175,000 gallons/day at North Larkspur; and 100,000 gallons/day at Sage Port. However, by the time one of these facilities reaches 95 percent of capacity, it is expected that Larkspur and Perry Park will have initiated a regional facility or other management option as recommended by the Chatfield Watershed Authority. No expansions of the interim facilities will be recognized without management agency consent.

The Perry Park Water and Sanitation District operates two wastewater treatment facilities: Waucondah and Sage Port. No facility upgrades were done in 1997 and no upgrades are planned within the next five years. There were no changes to the operation, maintenance or facility management in 1997. There were no changes to the facility’s operation, maintenance or management in 1997.

The Roxborough treatment facility was upgraded in 1996. System upgrades included the construction of new headworks, installing a new aeration system in the activated sludge aeration basin, added chemical treatment facilities for phosphorus removal and disinfection, and construction of a new laboratory and office building. No additional improvements are planned within the next five years. There were no changes to

maintenance or facility management in 1997. Treated effluent is no longer used for irrigation at the Arrowwood Golf Course and all treated effluent is discharged directly into the South Platte River. The facility experienced no compliance problems in 1997.

The Louviers wastewater treatment facility made two minor facility upgrades in 1996. The influent flow meter was converted from solar to direct charge and the effluent flow control was converted to siphon. A future planned upgrade is to change the influent flow measurement system from the restrictive V-notch to some other non-specified system. The effluent system is also planned for upgrade depending on results of a study in progress. The facility is in an extended permit mode until the upgrade study is completed. The facility has experienced problems meeting the phosphorus limits established in the control regulation. A new utility plan with alternative analysis is needed for the Louviers facility.

The Sacred Heart Retreat wastewater treatment facility has no poundage allocation and is considered to discharge to groundwater. No facility upgrades were done in 1996 and no upgrades are planned within the next five years. There were no changes to the operation, maintenance or management of the facility in 1996.

Cherry Creek Watershed

Status of total maximum daily load allocation program

Cherry Creek Basin Authority

The maximum quantity of phosphorus which could enter the reservoir annually while complying with the 0.035 mg/R total phosphorus standard for the reservoir was determined in the management plan. Using an in-lake phosphorus model, it was possible to predict the annual load of phosphorus from all sources combined that would be within the phosphorus limit. This allowable annual load became the phosphorus limit for the watershed. The annual load of phosphorus from wastewater treatment facilities (point sources), nonpoint sources and the background conditions was quantified. The wasteload allocation recommendations were incorporated in the control regulation. The control regulation is an EPA and state-accepted TMDL for the Cherry Creek Watershed.

Approved total phosphorus TMDL for Cherry Creek Watershed

Both point-source loading and nonpoint source loading will increase as growth occurs in the watershed. The point in the future when the combined total of sources reaches approximately 14,270 pounds is termed the *critical load*. The 2,310 pounds available to the point sources were then allocated to each of the 11 wastewater treatment facilities. This poundage limitation requires that the *Clean Water Plan* focus on a shorter time-frame represented by the *critical load* rather than focus on a specific time-frame through the year 2020.

The authority uses best management practices to limit nonpoint source pollution to the reservoir to less than 10,290 pounds annually. The best management practices are implemented by local governments, as outlined in the management plan and referenced in the *Clean Water Plan*. The choice of nonpoint source control measures is made by counties, municipalities or districts. The *Cherry Creek Reservoir Control Regulation* defines how removal of nonpoint source phosphorus is credited to the reserve pool, trading program and the review process necessary to make these types of changes to the regulation.

Management agency

The designated management agency for the Cherry Creek Watershed (Figure 13) is the *Cherry Creek Basin Authority* (Authority). The membership of the authority includes the Arapahoe County Water and Wastewater Authority, the Town of Castlerock, Cottonwood Water and Sanitation District, Pinery Water and Sanitation District, Inverness Water & Sanitation District, Meridian Metropolitan District, Parker Water & Sanitation District, the Town of Parker, Stonegate Village Metropolitan District, the City of Aurora, the City of Greenwood Village, and Douglas County. The authority was granted by statute on April 19, 1988 the power to set fees, assess a mill levy (not to exceed one-half mill) and issue bonds. Other activities of the authority include water quality monitoring and assessment, nonpoint source reduction, financial planning and water quality management.

The authority mission statement reads:

> A*To promote the preservation of water quality in Cherry Creek Watershed through mitigation of urban impacts for the benefit of the public for recreation, fisheries, water supplies and other beneficial uses within economic ability of the authority.*"

Wastewater management plan

The technical appendices to the *Clean Water Plan* contain detailed information about the wastewater treatment facilities and water quality assessments. Technical appendices will be maintained on an as-needed basis to reflect management agency activities. The major wastewater discharge permits in the watershed are Arapahoe County Water and Wastewater Authority (Cottonwood Water and Sanitation District), Pinery Water and Sanitation District, Inverness Water and Sanitation District, Meridian Metropolitan District, Parker Water and Sanitation District, and Stonegate Village Metropolitan District (Table 22). Effluent discharged from these facilities affects Cherry Creek Reservoir. The two minor facilities permitted in the watershed are DirecTV and Hughes Communication.

The point source management strategy can use up to 11 wastewater treatment facilities to provide wastewater service to the Cherry Creek Watershed. There are six discharging wastewater treatment facilities in the watershed with five listed facilities not producing any effluent discharge into the watershed. These facilities are either not built or they are transferring wastewater into the adjacent Chatfield Watershed for processing. Although these facilities produced no effluent, they still maintain a phosphorus allocation.

The 2,159 pounds allocated leaves a reserve pool of 303 pounds. The pool is part of the total point source phosphorus pounds, which may be contributed annually. The reserve will be managed and distributed by the commission, upon recommendation of the authority. The annual allocation of phosphorus among the 11 treatment facilities is distributed as shown in Table 23.

The management plan designates the type of wastewater treatment for each wastewater treatment facility in the Cherry Creek Watershed. The permits for dischargers require monitoring the phosphorus discharged from each facility. Dischargers using rapid infiltration have established monitoring wells below their infiltration ponds and down-gradient of the ponds. The facilities with slow rate land application have installed vacuum lysimeters. The effluent limit at wastewater treatment facilities is 0.2 mg/R.

The Pinery tertiary wastewater treatment facility wastewater treatment facility has a design capacity of 1.0 MGD with an organic loading capacity of 1918 pounds/day of BOD. The facility capacity can be expanded to 1.4 MGD to meet the projected 2020 flow. This facility is highly efficient at phosphorus removal and has experienced no compliance problems.

The existing Arapahoe and Cottonwood wastewater service areas, as identified in the *Clean Water Plan*, are consolidated into one single Arapahoe wastewater service area. The Arapahoe County Water and Wastewater Authority is the designated operating agency. The Cottonwood District will continue to operate under the terms of the 20-year intergovernmental agreement. The combined Arapahoe and Cottonwood wastewater treatment facility has a summer design capacity of 0.8 MGD and a winter capacity of 0.73 MGD. A site application to expand the capacity to 1.4 MGD is under consideration.

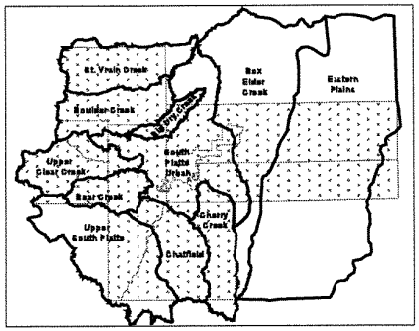
The Stonegate Village wastewater treatment facility has a design capacity of 1.06 MGD. The needed Stonegate facility capacity in 2020 is projected to be 1.8 MGD. The facility expansion to 1.06 MGD provides capacity through 2010. The Stonegate Village treatment facility can discharge as both a slow rate land application system and a surface discharge advanced wastewater treatment (AWT) facility. In order for the facility to meet the total phosphorus poundage allocation, the effluent limit for phosphorus should be set at 0.03 mg/l annual average, based on a 0.55 MGD design capacity. The combined phosphorus discharge from both a land application and The Inverness wastewater treatment facility has a design capacity of 0.9 MGD with an organic loading capacity of 2060 pounds/day BOD. The facility uses land application to

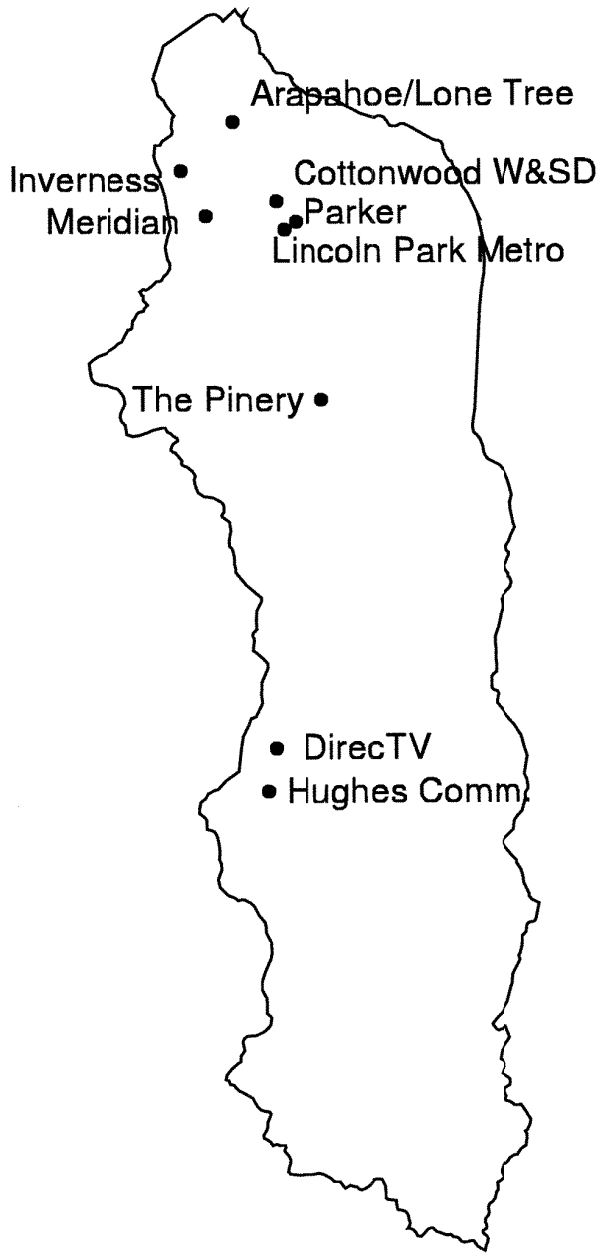
meet the phosphorus allocation limit. There are no wastewater issues associated with this facility.

The Meridian wastewater treatment facility has a design capacity of 1.25 MGD with an organic loading capacity of 1734 pounds/day BOD. The facility uses land application to meet the phosphorus allocation limit. There are no wastewater or phosphorus compliance issues associated with this facility.

The Parker wastewater treatment facility has a design capacity of 1.123 MGD with an organic loading capacity of 2000 pounds/day BOD. The district has two wastewater treatment facilities, known as north and south, to treat sewage collected within the district. Each facility utilizes the activated biosolid process for secondary treatment of the wastewater. The north facility has a combination flocculation, sedimentation, filtration facility for further advanced wastewater treatment. This facility is rated at 0.123 MGD. The south facility has a 1 MGD advanced wastewater treatment facility utilizing the absorption clarifier-filtration system. Both advanced wastewater treatment units will achieve consistent phosphorus concentrations below 0.2 mg/l. Advanced wastewater treatment effluent from both facilities is combined and discharged at a single outfall point on the Bar CCC Ranch at Sulphur Gulch and Cherry Creek.

Figure 13
Cherry Creek Watershed





Cherry Creek Watershed
Wastewater Treatment Facilities

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DRCOG

Table 22 Cherry Creek Watershed Wastewater Treatment Facilities

Operating Agencies	Permit	Facility Size	Design Capacity		Estimated Date at		2020 Needed Capacity	
			Hydraulic (MGD)	Organic (lbs/day)	80% Capacity	95% Capacity	Hydraulic (MGD)	Organic (lbs/day)
Arapahoe CW&WA	CO-0040681	Major	0.8/0.73	2000	1999	2000	1.4	
Cottonwood W&SD	CO-0039845	Merged	0.25	552				
Pinery W&SD	CO-0041092	Major	1	1918	2005	2010	1.4	2700
DirecTV	CO-0044725	Minor	0.0045	12				
Hughes Communications	Site application	Minor	0.025	6				
Inverness W&SD	CO-0038679	Major	0.9	2060	2026	2036	0.6	1376
Stone gate Village	CO-0040291	Major	1.06	1147	1998	2000	1.81	
Meridian Metro District	CO-0039110	Major	1.25	1734	2020	2030	1.25	1734
Parker W&SD	CO-0040797	Major	1.855	4000	2010	2015		
Rampart Range	Proposed					1994		
Rangeview Metro District	Proposed							

Note: The proposed Rangeview Metropolitan District has not been formally recognized by the Cherry Creek Basin Authority, but has been submitted to the council for consideration as a new wastewater treatment facility.

Table 23 Phosphorus Poundage Allocation in Cherry Creek Watershed

Wastewater Treatment Facility	Total Pounds Phosphorus
Arapahoe CW&WA/Cottonwood Water and Sanitation District	567[1]
Pinery Water and Sanitation District	213
Inverness Water & Sanitation District	68
Meridian Metropolitan District	114
Parker W & S District	533
Stonegate Village Metropolitan District (46 pounds temporarily allocated from reserve pool)	99
Castle Rock (Mitchell Creek) (Served by Plum Creek Wastewater Authority)	128
Castle Rock (Cherry Creek) (Served by Plum Creek Wastewater Authority)	21
Castle Rock (McMurdo Gulch)	64
Castle Rock (Newlin Gulch)	86[2]
Rampart Range	160
Reserve Pool (Allocated 303 pounds)	257
Total	2,310

[1] The Arapahoe County Water and Wastewater Authority operates both the Lone Tree and Cottonwood facilities as previously detailed pursuant to an intergovernmental agreement between the Cottonwood District and the Arapahoe County Water and Wastewater Authority.

[2] The Castle Rock, Cherry Creek facility will probably serve a portion of the Newlin Gulch facility up to 51 pounds annually. In this case, 51 pounds would be subtracted from the 86 pounds listed on this table and added to the Castle Rock, Cherry Creek facility.

South Platte Urban Watershed

Status of total maximum daily load allocation program

South Platte Urban Steering Committee

A new total maximum daily load study was initiated by DRCOG under a grant from EPA to WQCD in January 1995. The TMDL process has been initiated in the urban portion of the South Platte Urban Watershed shown in Figure 14. Periodic exceedences of numeric standards have been documented for most of the stream segments in the South Platte Urban Watershed. Sources for this water quality degradation have been associated with point sources (domestic and industrial), urban runoff during storm events, dry weather urban runoff and nonpoint sources (USEPA 1983; DRCOG 1994; WQCD 1996).

Phase II TMDL program produced calibrated stream and watershed models with recommendations for nitrate and copper

The TMDL process is being implemented using a phased approach. Constituents of concern have been identified and prioritized. Those constituents of highest concern and with sufficient data to perform a TMDL will be addressed first. For constituents with large data gaps a monitoring plan is developed to provide sufficient information to perform the TMDL analysis. The TMDL analysis characterizes both low-flow and wet weather conditions in the South Platte urban watershed. These two scenarios represent critical conditions within the receiving waters. During low-flow conditions the loading capacity of the receiving waters is at its lowest. During wet weather conditions the receiving water loading capacity is higher but the storm water load may also be higher. The TMDL process includes projections of pollution problems and proposed solutions on a 20-year planning horizon.

The phased approach concept takes a limited set of specific priority constituents and systematically evaluates them through the water quality models using the approach developed in the *South Platte Urban Watershed Phase II TMDL Program* process. The implementation of a necessary TMDL identified during one phase of the evaluation process may extend into later phases. The concept is to have all constituents of concern monitored, evaluated and modeled within about five years. The full implementation TMDLs may take an additional five years. Continuous funding is required to make this phased approach viable and complete this process within this time-frame. The goal is to have no significant exceedence of any water quality standards in the South Platte Urban Watershed by 2010.

This recent TMDL work meets the following objectives:

- describes the regulatory TMDL process;
- outlines the application of a TMDL process to the South Platte Urban Watershed;

- educates potential stakeholders within the watershed on the TMDL process, compliance approaches and implementation requirements;
- defines TMDL screening criteria;
- describes the selected TMDL models;
- provides a data review and calibration results for copper and nitrate;
- describes a watershed monitoring program; and
- recommends future TMDL actions.

There have been over 100 water quality or environmental related studies, assessments or reports completed within the South Platte Urban Watershed. These studies and reports provide a characterization of stream quality, wasteload allocations, urban runoff (includes nonpoint sources and stormwater sources) loading and quality, hydrology, geology, drainage, environmental features, management programs and water/environmental assessments.

A watershed-based approach will be used to evaluate and develop TMDLs and to bring the South Platte River into compliance with water quality standards. Funding mechanisms are identified to reduce loadings to capacity levels and future actions are recommended to assess control actions and enhance the TMDL. A monitoring plan is outlined to verify the modeling results and fill data gaps for the future phases of the TMDL. A mechanism for making recommendations to remove segments from the 303(d) list will be developed for those segments which data analysis and modeling indicates water quality standards are currently being met and will continue to be met.

Management agencies

Table 24 lists the management and operating agencies in the South Platte Urban Watershed (Figure 14). The only joint management association is the Adams County Water Quality Association. New associations and/or management agency structures are anticipated for participants in the South Platte Urban Watershed TMDL program. The technical appendices to the *Clean Water Plan* contain detailed information about the wastewater treatment facilities and water quality assessments. Technical appendices will be maintained on an as-needed basis to reflect management agency activities.

The Adams County Water Quality Association is the management agency for wastewater treatment in the Central Adams Service Area. The association includes Adams County, Commerce City, South Adams Water and Sanitation District, and the City of Brighton. This association establishes the necessary framework for a joint

wastewater management agency for this area. The roles and responsibilities of the operating agencies and the entities with land use responsibility are defined in relation to joint management. The association has a board of directors consisting of balanced representatives from each of the participating entities. The association is responsible for point source management in the Central Adams service area and the non-urban portion of the Barr Lake hydrological system. The association does not manage non-point or stormwater sources within the service area.

Three wastewater treatment facilities are designated for the service area with Brighton having one facility and South Adams with one existing facility and one proposed package plant. Brighton and South Adams are designated as the only wastewater treatment operating agencies and no other treatment facilities will be recognized unless the entire wastewater management strategy for the northern metropolitan region is revised.

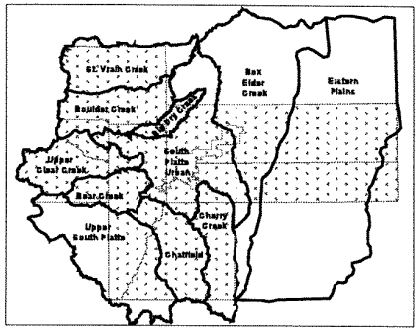
The Metro Wastewater Reclamation District is a special district that has been designated as a wastewater management agency. The Metro District provides wastewater treatment service to a majority of the metropolitan region. The second-largest discharge is from the jointly owned Littleton and Englewood wastewater treatment facility. The other management agency in the watershed included in Table 24 is the City of Aurora. Operating agencies are the responsibility of the appropriate county (Denver, Adams, Arapahoe or Jefferson County).

Wastewater management plans

A wastewater management planning strategy for the northern metropolitan region was developed through the Lower South Platte Studies (DRCOG 1989). An objective of the study for the Lower South Platte Region was to identify cost-effective long-term wastewater service, while maximizing the use of existing wastewater treatment facilities. The recommendations from the study could provide the region's citizens cost-effective wastewater service while meeting water quality goals. The study includes both short-term and long-term wastewater service planning recommendations. Treatment facility utilization, service area designations, management agencies and institutional roles were identified in the study.

The long-range plans for the area north of the Denver International Airport includes options of pumping the wastewater into the main portion of the service area or a possible regional facility on Box Elder Creek. The *Water and Wastewater Service Study for South Adams County Water and Sanitation District* (Black & Veatch 1991) study evaluates future service areas. A package land application wastewater treatment facility sized for 0.07 MGD is adequate to meet the current 2020 forecasts. The final site for this package facility should be determined by the Adams County Water Quality Association and included in a future *Clean Water Plan* update.

Figure 14
South Platte Urban Watershed



South Platte Urban Watershed
Wastewater Treatment Facilities

DRCOG

A new regional wastewater treatment facility is the designated long-term wastewater management strategy for a northern portion of the South Platte Urban Watershed, referred to as the Lower South Platte region. The major participants in the long-term regional facility will include Brighton, South Adams and Metro District (Thornton). Involvement of Broomfield,and Northglenn and will be determined at initiation of the regional facility option.

There was a consensus among all potential participants in the regional facility option that a construction trigger date should be reasonably consistent to accommodate all involved facility expansions. A regional facility could be feasible by 2005 to serve the Brighton, Commerce City and Thornton communities. By 2005, wastewater flows are expected to exceed the capacity of the Metro District's Brantner Gulch pump station and force main system. Diverting flows to a new regional facility could be more cost-effective than expanding the Brantner Gulch pumping system.

Placement of a regional facility in the northern portion of the Central Adams service area or in Weld County near Highway 7 is the preferred facility siting option. The regional facility should be sized to have an initial capacity of 5-15 MGD. No future size will be designated for the regional facility until a planning study is complete by 2001. The estimated facility *foot-print* acreage should be set at 80 acres. This site size would provide a buffer and provide for significant expansion of the facility. The facility design should include an evaluation for advanced treatment of ammonia with nitrification and de-nitrification systems. The Central Adams service area is experiencing significant growth since the new Denver airport is located adjacent to the service area. Both facilities may require interim limited expansions before the regional solution is triggered, but any approved expansions should be sized and scheduled in a manner, that facilitates implementation of the regional solution. The Brighton facility may need an expansion by 1999 to accommodate its portion of the watershed flow. The Brighton facility would need a design capacity of up to 4.1 MGD. At worse case without increased growth, this expansion would allow the facility to treat wastewater flow beyond 2015. The Brighton wastewater treatment facility has recently purchased all available adjacent land and has limited space for expansion up to but not exceeding 4.1 MGD.

The South Adams facility may need an expansion beyond its current 4.4 MGD capacity as early as 1999 to accommodate its portion of the watershed. The additional capacity may be needed to accommodate flows from the district’s developing northern service area. In the long term, it is anticipated that this additional capacity will be used to treat increasing flows from the district’s southern service area. The northern distribution system is being designed so flows can be easily redirected to a regional facility. The existing South Adams treatment facility can be expanded on the current site to a capacity of 7.0 MGD, if necessary. Any expansion of the South Adams treatment facility beyond 4.4 MGD should be carefully evaluated in relation to the implementation of the regional solution.

The new Denver airport site is shown in the CWP as served through the Metro District's Sand Creek system. The Denver Water Board has begun planning for wastewater reuse at the new airport. The plan calls for wastewater treated at the Metro District central facility eventually being distributed for reuse to the airport gateway area and the airport itself.

Wastewater service to the Barr Lake Metropolitan District will be provided by either of the designated Central Adams Service Area operating agencies: the City of Brighton or the South Adams Water and Sanitation District. Either facility has treatment capacity to serve the Barr Lake Metropolitan District.

There are two key trends that underlie the Metro Reclamation Wastewater District Strategic Plan, as adopted by the district's board of directors early in 1992:

- There will be increasing expectations by the public and government to protect the environment and reduce public health risk.

- There will be a shift in emphasis in the metropolitan area from upgrading, expanding, and maintaining wastewater transmission and treatment systems to water quality and management of water resources.

The Metro District average effluent discharge is about 140 MGD. This effluent discharge is a significant point source flow into segment 15 of the South Platte River. The EPA and Water Quality Control Division agreed through the NPDES and Colorado Discharge Permit System permit processes and based on water quality and modeling efforts, to set seasonal un-ionized ammonia standards (ranging from 10-14 mg/l) on segment. Based on these ammonia requirements, the Metro District added nitrification to its north facility. Nitrification facilities became operational in 1990 at the north complex of the metro District central treatment facility. This nitrification has lowered un-ionized ammonia levels in segment 15 and the segment now meets the un-ionized ammonia standard. Water quality data for the segment shows a general improvement in quality over the last six to eight years. Improvements in effluent quality have directly improved river water quality.

In 1992, the Metro District intensified efforts to help improve the levels of dissolved oxygen in the South Platte River. This project has helped the district understand the seasonal physical, biological, and chemical processes at work in segment 15 of the river. Called the segment 15 Scientific Studies and Stream Channel Improvements Project, this is a groundbreaking scientific effort. It has helped the district determine the causes of low levels of dissolved oxygen (DO) in certain areas of segment 15.

The Metro District will operate another new facility, the Upper Sand Creek facility, to serve future growth in the Sand Creek Basin. Details are contained in the 1985 Sand Creek Facility Plan and its supplement, which Metro District completed in 1987 (Camp Dresser & McKee Inc. 1985; 1987). The service area for this facility was revised in

1988 to add an area just north of the Douglas-Arapahoe county line. This new facility is expected to be designed, constructed and operational sometime shortly after 2005.

The Marcy Gulch (Centennial Water and Sewer District) wastewater treatment facility discharges into segment 6 via the Marcy Gulch tributary below Chatfield Dam. The Littleton\Englewood wastewater treatment facility, operated by Littleton and Englewood, discharges into segment 14 as do several industrial dischargers. The Glendale wastewater treatment facility discharges into Cherry Creek, which discharges into segment 14 of the South Platte River.

The previous ammonia problem in segment 14 of the South Platte River has been corrected by the cities of Littleton and Englewood. The Littleton/Englewood wastewater treatment facility has added nitrification facilities, which are fully operational, and the CDPS permit has new ammonia discharge limitations based on the Segment Wasteload Allocation Study (DRCOG 1990b). The Centennial Marcy Gulch wastewater treatment facility permit was renewed by the WQCD. Modifications made to this permit will require re-visiting the segment 6/14 QUAL2E model. The model modifications will be incorporated into the metropolitan total maximum daily load process.

The wasteload allocation in segment 14 is flow-based and related to the time the Littleton\Englewood facility reaches 30.5 MGD. Although DRCOG projects the facility will not reach the 30.5 MGD discharge limit until 2015, the facility is being designed to accommodate 32 MGD. If more service area flow occurs at the facility than projected by 2015, then a new allocation model will need to be adopted for the changed projections.

Permits for discharge into segment 14 will include both chronic (30-day) and acute (one-day) limits for ammonia. However, chronic limits (30-day) are more restrictive and controlling for ammonia. The dischargers into segment 14 will be responsible for initiation of future monitoring programs and additional model analyses.

The Arapahoe Park Racetrack began operation in the spring of 1992. The existing wastewater treatment facility for the park applied for a site application and NPDES permit in early 1992. The wastewater treatment facility is included in the CWP as an interim minor facility. The facility should be abandoned when other sewer service becomes available in the future. Therefore, the facility is being treated as an interim facility. If no other wastewater service options become available within 10 years, then the facility should be re-evaluated to become a minor facility.

Clear Creek Valley also operates a facility, which can bypass flows to the Metro District facility. The Denver North Campground is a minor facility with a design capacity of 0.0105 MGD. Hi-lands Acres Sanitation District operates a wastewater treatment facility with a design capacity of 0.69 MGD, which classifies this facility as major. Additional planning information needs to be developed for this facility. The wastewater treatment facility at the Jefferson County Airport is also a major facility with a design capacity of

0.05 MGD. Additional planning information needs to be developed for this facility. The wastewater treatment facility at the Rocky Flats Plant is a special case major facility with a design capacity of 0.05 MGD.

The work force and daily visitors at Rocky Mountain Arsenal generate domestic-type sewage that must be treated and discharged or otherwise disposed. The army operates a small zero-discharge biological treatment system. In addition, two smaller septic systems were installed at temporary *Interim Response Action* work sites that are not served by the revised sewer system. The systems treat only domestic sewage. They will not treat wastewater or other materials generated by industrial activities or the contamination remediation process. The new wastewater treatment facility is a minor facility under the provision of the CWP. The Adams Water Quality Association reviews any wastewater management plans for the Rocky Mountain Arsenal.

Table 24 South Platte Urban Watershed Wastewater Facilities

Management (M) and Operating Agencies	Permit	Facility Size	Design Capacity		Estimated Date		2020 Needed Capacity	
			Hydraulic (MGD)	Organic (lbs/day)	80% Capacity	95% Capacity	Hydraulic (MGD)	Organic (Lbs/day)
Arvada Reuse	Proposed							
Aurora, City of (M)	CO-0026611	Major	2.5	4850			7.5	14550
Barr Lake R.V. Park	COG-630019	Minor	0.015					
Brighton, City of (M)	CO-0021547	Major	2.63	4890	2005	2010		
Centennial W&SD	CO-0037966	Major	8.5	19450	2008	2012	11	23000
Clear Creek Valley	CO-0020206	Major	2.8	4180				
Coors/ Golden (M)	CO-0001163	Major	7	60000				
Foxridge Farms Mobile	CO-0028908	Major	0.13		2015			
Glendale, City of (M)	CO-0020095	Major	2	33			2	4106
Hi Land Acres Water & San.	CO-0022594	Major	0.069	168	2010			
Littleton/Englewood (M)	CO-0032999	Major	36.3	65000	2000	2007	41.4	74000
Lochbuie, Town of (M)	COG-581001	Major	0.18	1229				
Metro Wastewater Reclamation (M)	CO-0026638	Major	185	169 tons	2000	2020		
OEA, Incorporated	CO-0042196	Minor	0.0833	371				
Racing Assoc. of Colorado	COG-582026	Minor	0.03	100				
Rocky Mountain Arsenal	CO-0021202	Major	0.07					
South Adams County W&SD	CO-0026662	Major	4.4	9210	1999	2000	12.5	22938
Tomahawk Truck Stop	CO-0042421	Minor	0.012	40	2010	2015	0.02	67
Upper Sand Creek	Proposed	Major	8				16	

St. Vrain Watershed

Status of total maximum daily load allocation program

Tri-Basin Workgroup

The *Clean Water Plan* has recognized for seven years that a more comprehensive wasteload allocation modeling effort is needed in the St Vrain Watershed. The *Clean Water Plan* further recommends that a total maximum daily load (TMDL) be completed in the St. Vrain Watershed before any additional wastewater treatment facilities are recommended. The plan identified the Tri-Basin Workgroup as the institutional group of stakeholders to develop the TMDL for these watersheds.

Ammonia wasteload allocations in wastewater discharge permits

All identified data sources were researched and available data was tabulated into an electronic data base. Identified sample sites were mapped and appropriate data was linked to these sites. A watershed map with sampling locations was developed for planning purposes. A schematic of the watershed hydrology was developed for potential modeling assessment (see the Boulder Watershed TMDL section of this document for a description of the available water quality data and potential for water quality modeling).

Management agency

The two management agencies in the St. Vrain Watershed (Figure 15) are Longmont and Lyons (Table 25). Boulder County is responsible for the 10 operating agencies in the St. Vrain Watershed shown in Table 25, along with an additional 10 smaller facilities listed in Table 17 (Boulder Watershed section). The management and operating agencies in the watershed are participants in the Tri-basin work group.

The basic membership of the Tri-basin work group includes the major wastewater treatment facility management agencies (City of Boulder, Boulder County, City of Broomfield, Town of Erie, City of Lafayette, City of Longmont, City of Louisville, Town of Lyons, Town of Nederland and Town of Superior). Other wastewater treatment facilities operating in the watershed and those in Weld County discharging to the St. Vrain River will be involved in appropriate water quality forums or special water quality issue meetings. The North Front Range Water Quality Planning Association and DRCOG will attend meetings of Tri-basin Work Group and provide reasonable assistance if requested.

The Tri-basin Work Group is responsible for developing any scope of services for future water quality studies, providing a forum for water quality issues and disseminating regionally important water quality or other environmental information. The Tri-basin Work Group could also be responsible for implementation of these studies. The Tri-

basin Work Group will be used by DRCOG to assist in the water quality assessment and wastewater management planning for the tri-basin area through the CWP amendment process.

Wastewater management plan

The technical appendices to the *Clean Water Plan* contain detailed information about the wastewater treatment facilities and water quality assessments. Technical appendices will be maintained on an as-needed basis to reflect management agency activities. The four major dischargers in the St. Vrain Watershed are the cities of Longmont and Lyons, the Niwot Water and Sanitation District and Fairways Metropolitan District. Longmont has sufficient capacity until 2015. The Lyons wastewater treatment facility has sufficient capacity through the year 2015 and does not have problems meeting water quality standards.

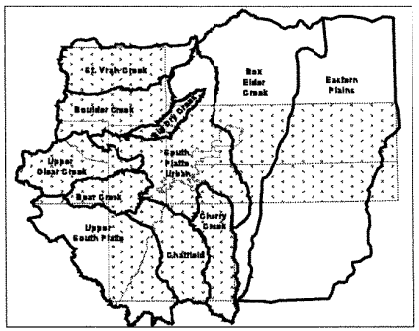
The Fairways Metropolitan District has design capacity of 0.1073 MGD, which is anticipated to be sufficient for full build-out of the district. The Fairways Metropolitan District wastewater treatment facility was expanded to accommodate build-out in 1997. The facility expanded to 0.1073 MGD. The service area for this facility will remain as the district's boundaries.

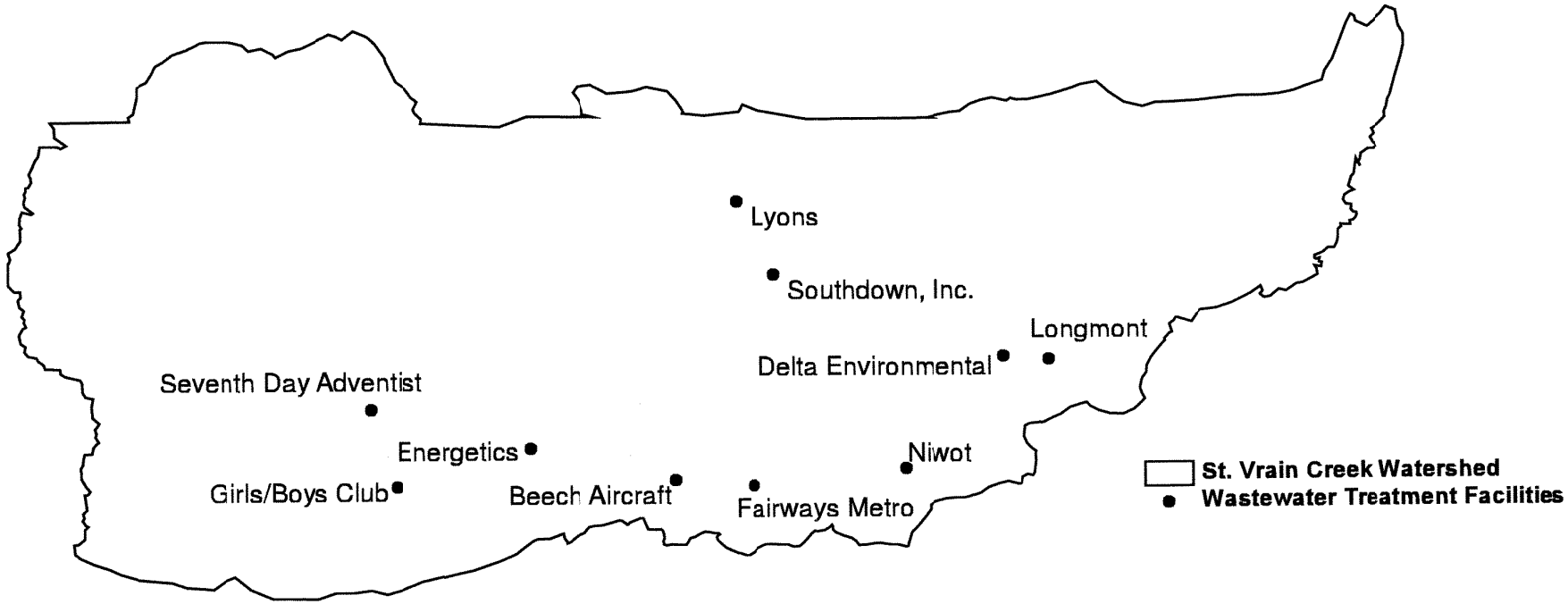
The capacity of the City of Longmont wastewater treatment facility is 11.5 MGD. Current annual average wastewater flows are 7.0 MGD. Longmont discharges into segment 3 of the St. Vrain River, which has a 0.06 mg/R ammonia standard. Monthly ammonia limits were imposed in the Longmont permit by the Water Quality Control Division. The City of Longmont wastewater master plan includes wetlands and similar alternative technology, as a means to reduce effluent limitations. The types of in-stream improvement would be similar to those being done by the City of Boulder.

The Town of Lyons wastewater treatment facility was recently upgraded. A new flow monitor was installed, which showed that the facility has 30 percent lower inflow than previously measured. The facility is at 60 to 70 percent of capacity. The design capacity of the facility is 0.286 MGD with an existing flow of 0.15 MGD. Growth in the area has remained constant with 10 new homes added to the system. An evaluation of the facility was made to assess the potential for on-site improvements. The study concluded that a future upgrade of the existing facility would be difficult and generally limited. The facility outfall was moved 200 feet downstream to protect the City of Longmont drinking water supply intake.

The Niwot wastewater treatment facility has a design capacity of 1.1 MGD. Regional projections suggest that this capacity is sufficient through 2020. Expansion of the facility to 1.1 MGD allowed greater treatment time before the effluent was released and has reduced the potential for permit violations. The district analysis showed effluent treatment was most effective at 60 to 80 percent of design capacity. The facility

Figure 15
St. Vrain Creek Watershed





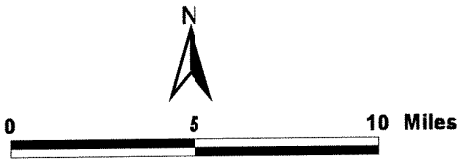


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Table 25 St. Vrain Creek Watershed Wastewater Treatment Facilities

Management (M) and Operating Agencies	Permit	Facility	Design Capacity					
			Hydraulic	Organic (lbs/day)	80%	95% Capacity	Hydraulic (MGD)	Organic (Lbs/day)
Boy Scouts of America	COG-620007	Minor	0.0027					
Boys/Girls Club Metro Denver	COG-620054	Minor	0.006					
Dakota Ranch	Site application	Minor	0.01228					
Fairways Metro District	CO-0038156	Major	0.1073	175		Build-out		
Gold Lake Ranch	Site application	Minor	0.0054		2015			
Highlands Presbyterian Camp	COG-620025	Minor	0.0023					
Lefthand W&SD	COG-630018	Minor	0.03					
Longmont, City of (M)	CO-0026671	Major	11.55	23000	1996	2003	15.4	26800
Lyons, Town of (M)	CO-0020877	Major	0.286	540				
Niwot Sanitation District	CO-0021695	Major	1.1	1480				
Seventh Day Adventist	CO-0030112	Minor	0.03	50	2050	2100	0.04	65
St. Malo Retreat Center	COG-620037	Minor	0.027855					

capacity of 1.1 MGD should allow the district to maintain this range even at build-out of the district.

Upper Clear Creek Watershed

Status of total maximum daily load allocation program

Upper Clear Creek Watershed Association

Historic mining activities have left hundreds of old mine tailings and waste rock piles in the Clear Creek watershed. These piles are often located in or near Clear Creek or its tributaries. Erosion of these mine waste piles, especially during storms and snow melt, introduces metals into the water. Even more severe impacts are caused by abandoned mine tunnels which continue to drain acidic and metal-laden water into Clear Creek. The Clear Creek/Central City Superfund Site was placed on the National Priorities List to address the worst of these problems. The Superfund Study Area encompasses the upper Clear Creek Watershed to Golden. However, only about two dozen properties in Clear Creek and Gilpin counties comprise the Superfund Site.

No TMDLs in watershed; record of decision for selected mine sites

Most notably, a water treatment plant has been constructed in Idaho Springs at the Argo Tunnel. The 200 gallon per minute (gmp) discharge from the Argo Tunnel has a pH ranging between 2.0 and 2.5 standard units. Before this water was being treated, it added about 740 pounds of metals to Clear Creek daily. The treatment plant is a dual-train treatment system with a total treatment capacity of 700 gpm. The treatment is a sodium-hydroxide precipitant/high-density sludge process. An NPDES permit for the Argo Tunnel treatment plant is not required because the plant was build on-site using Superfund authorities. However, effluent limits for the treatment have been established and are contained in the "Argo Tunnel Applicable and Relevant and Appropriate Requirements" (ARARs) Compliance Document. The ARARs is a document very similar in form to an NPDES permit. The treatment plant is still in the start-up phase, so it is too early to measure in-stream improvements. A predictive water quality model has shown this treatment plant can significantly reduce metal loading to Clear Creek.

A pilot scale constructed wetlands was built in Silver Plume to see if this technology was effective in treating the mine drainage coming from the Burleigh Tunnel. The wetland was designed with two cell: a down-flow cell, and an up-flow cell. After initially promising results, the wetlands treatment system has failed to live up to expectations. The EPA and Water Quality Control Division Superfund program is currently re-

evaluating what should be done with the Burleigh Tunnel discharge. Part of this re-evaluation includes a study of the potential impacts of the Burleigh Tunnel discharge on the Georgetown Reservoir.

The EPA and Water Quality Control Division Superfund program does not currently have definitive plans for how to address the other abandoned mine tunnel discharges included in the Clear Creek Superfund Site. These are the discharges from the Big Five Tunnel in Idaho Springs, the Quartz Hill Tunnel in Central City, and the Gregory Incline and National Tunnel in Black Hawk. Several mine tailings and waste rock piles have been cleaned up under the Superfund program. The Minnesota Mine tailings located in and around the upper reaches of Lion Creek, a tributary to the West Fork, were reclaimed by EPA, Water Quality Control Division, and the U.S. Forest Service during the fall of 1996. The Black Eagle mill tailings were cleaned up by Jack Pine Mining Co. in 1994. In 1993, the McClelland tailings near Dumont were reclaimed by EPA, Water Quality Control Division, Colorado Department of Transportation (CDOT) and Clear Creek County.

Eight Superfund properties in Central City and Black Hawk have been cleaned up by casino developers since 1993. These sites include the Clay County tailings, the National Tunnel mine dump, the Gregory Incline tailings, Mill sites 12 and 13 of the Golden Gilpin Mill property, and the North Clear Creek tailings. Three different developers cleaned up their properties, which had been contaminated by the acid drainage coming from the National Tunnel. Plans for 1998 include cleanups of the Big Five waste rock dump in Idaho Springs, the Little Bear tailings near Idaho Springs, and Gregory Gulch #1 and #2 tailings piles in Central City.

TMDLs will be required for manganese, copper, zinc, iron, and cadmium (possible for radium?) in certain segments of Clear Creek identified in the 1998 303(d) list. No TMDLs have been completed to date. The role the Upper Clear Creek Watershed Association will take in any TMDL efforts is yet to be determined. There is strong support throughout the watershed for abandoned mine site or “orphan site” clean up. Efforts are hampered, however, by potential liability under the federal Clean Water Act and CERCLA for continuing discharges remaining after clean up or for only partial success. In effect, the volunteer can become a responsible party liable for continuing pollution. Until the liability issue is addressed, there is a strong disincentive to any member of the regulated community cleaning up orphan sites. DRCOG supports changing the Clean Water Act or working through other legislation to establish a *good Samaritan* provision that protects voluntary clean-up efforts from potential liability.

DRCOG developed a watershed model for the Upper Clear Creek Watershed Association (UCCWA) using EPA’s QUAL2E model. The watershed model was developed to analyze nutrients in connection with the narrative standard for Standley Lake. It can be adapted for use in analyzing metals, and will likely be a useful tool for developing TMDLs. The model predicts responses to point source and nonpoint source loads, and can evaluate alternative control measures.

Downstream cities that store drinking water in Standley Lake (Thornton, Westminster, Northglenn) have expressed concerns about nutrient loading, primarily phosphorous and nitrogen, from upstream sources. The Standley Lake cities have worked cooperatively with UCCWA to implement nutrient control activities as outlined in the Clear Creek Watershed Agreement. Pursuant to the agreement, members of the UCCWA have implemented voluntary measures to control point source and/or nonpoint source nutrient loading. These include capital projects at wastewater treatment facilities, operational and unit process changes to enhance nutrient removal, adoption of best management practices, improved enforcement of individual sewage disposal system (ISDS) standards, requiring upgraded ISDS where appropriate, and extensive modeling and monitoring. The intent of the UCCWA and its members is to continue to work cooperatively toward nutrient control in the watershed through voluntary actions to achieve the mutual goal of no violations of the narrative standard.

As requested by the parties to the agreement, the Water Quality Control Commission approved the agreement and adopted a narrative standard for nutrients calling for maintaining Standley Lake's historic mesotrophic status which, to date, has not been defined. The agreement called for no new requests for further regulations through 1997. Thus far, most of the requirements of the agreement have been completed. The parties are currently discussing the merits of a new agreement.

Management agency

The Upper Clear Creek Watershed Association (Figure 16) is the management agency for the watershed. A memorandum of understanding provides a framework and opportunity for joint participation in the association. Eligible association members include the City of Black Hawk, Central City, Town of Empire, Town of Georgetown, Town of Silver Plume, City of Idaho Springs, City of Golden, Central Clear Creek Sanitation District, Black Hawk/Central City Sanitation District, St. Mary's Glacier Water and Sanitation District, Clear Creek County, Gilpin County, Jefferson County, Clear Creek Skiing Corporation, Climax Molybdenum, Coors and Schwayder Camp.

The Upper Clear Creek Watershed Association is involved with maintaining a stream monitoring program, collecting stream and wastewater facility data, modeling stream quality, assisting with compliance problems, supporting the local Technical Advisory Committee (TAC) team, and participating with the Clear Creek Forum steering committee and Clear Creek watershed initiative.

Wastewater management plan

There are six municipal and seven private or industrial wastewater treatment facilities in the watershed (Table 26). The municipal facilities include Central Clear Creek Sanitation District, Town of Empire, Town of Georgetown, City of Idaho Springs, St. Mary's Glacier Water and Sanitation District and the Central City/Black Hawk Sanitation District. The private facilities include the Clear Creek Skiing Corporation, the Climax

Molybdenum Company Henderson and Urad Mine Facilities, Schwayder Camp, CDOT Eisenhower, Clear Creek Convenience, Mt. Vernon Country Club and Reverends Ridge Campground. The Central Clear Creek District, Georgetown, Golden (Coors), Empire, Idaho Springs, Central City/Black Hawk facilities and Climax Molybdenum (special case) are major facilities as defined in the CWP. The Clear Creek Skiing Corporation and St. Mary's Glacier facilities are defined as minor facilities.

The operating agencies in the basin include Black Hawk/Central City Sanitation District, Central Clear Creek Sanitation District, St. Mary's Glacier Water and Sanitation District,

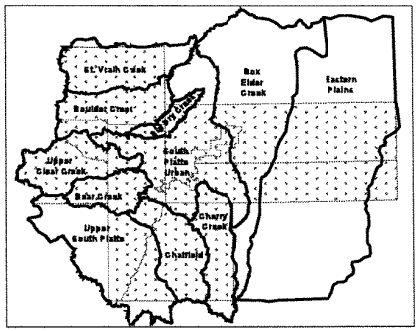
Town of Empire, Town of Georgetown, Coors (City of Golden) and City of Idaho Springs. Clear Creek Skiing Corporation, Climax Molybdenum and Coors are considered industrial dischargers and function as operating agencies for their respective facilities. The technical appendices to the *Clean Water Plan* contain detailed information about the wastewater treatment facilities and water quality assessments. Technical appendices will be maintained on an as-needed basis to reflect management agency activities. The association is developing water quality and wastewater management strategies for incorporation into the technical appendices of the *Clean Water Plan.*

The City of Golden service area receives domestic wastewater service from the Adolph Coors Company plant, which discharges into the Lower Clear Creek Basin below the Croke Canal. The Golden service area is located in the Upper Clear Creek Basin. The City of Golden is a member of the Upper Clear Creek Watershed Association. This Golden/Coors facility has adequate capacity to meet both Coors' and Golden's needs through 2015. Coors also operates interconnected facilities to treat brewery waste.

The Black Hawk/Central City Sanitation District Phase 1 wastewater treatment facility has been completed. The present permitted nominal plant capacity is 1.125 MGD and a BOD loading of 3,750 pounds per day. This plant was designed to attain biological nutrient removal below the levels of 10 milligrams per liter total nitrogen and 4 milligrams per liter total phosphorous. The new plant is located at the site of the original plant, on the right bank of the North Fork of Clear Creek, on the eastern edge of Black Hawk.

There has been strong community interest in developing a regional approach to wastewater treatment for the area. The public indicated a desire to construct a new regional wastewater treatment facility downstream from Black Hawk and strategically located to provide necessary service to the existing community, as well as anticipated growth in the surrounding region. The district prepared a Phase 2, 201 facility plan in August 1997. The district's service area was modified during preparation of the facility plan to reflect current comprehensive planning by the serviced municipalities and Gilpin County. Based on predicted growth rates, the Phase 1 facility has adequate capacity for about five years. The principal purposes of completing the facility plan at this time were:

Figure 16
Upper Clear Creek Watershed



St. Mary's Glacier

Blackhawk/Central City

Central Clear Creek

Empire

Idaho Springs

City of Golden

Georgetown

Clear Creek Skiing Corp

Schwayder Camp

Upper Clear Creek Watershed
Wastewater Treatment Facilities

N

0 5 10 Miles

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Table 26 Upper Clear Creek Watershed Wastewater Treatment Facilities

Operating Agencies	Permit	Facility Size	Design Capacity				2020 Needed Capacity	
			Hydraulic	Organic		95% Capacity	Hydraulic	Organic
Black Hawk/Central City	CO-0023949	Major	1.125	3750		1997		
Black Hawk/Central City - New	Proposed	Major						
CDOT, Eisenhower	CO-0026096	Minor	0.072	60				
Central Clear Creek	CO-0030121	Major	0.1	150	2005	2015		
Clear Creek Convenience	COG-584027	Minor	0.002	4.2				
Clear Creek Skiing Corp	CO-0040835	Minor	0.03	63	1995			
Cyprus Amax Minerals	CO-0041467	Major						
Empire, Town of	CO-0020575	Major	0.06	200.5				
Georgetown, Town of	CO-0027961	Major	0.58	407				
Idaho Springs, Town of	CO-0041068	Major	0.6	1000				
Mt. Vernon Country Club	COG-630061	Minor	0.007					
Reverends Ridge Campground	COG-630066	Minor	0.0155					
Schwayder Camp WWTF	COG-584009	Minor	0.001831	32.4			0.009	32
St. Mary's Glacier	CO-0023094	Minor	0.03					

1. Provide a master plan for service to the study area and guidelines for provision of trunk and interceptor sewers.

2. Select a suitable regional plant site, which can be acquired at this time, in preparation for the future based on the following criteria:

    a. Providing service to the entire study area at a reasonable cost for the collection system and trunk sewers

    b. having adequate land so that the predicted ultimate flows can be treated at the site, assuming the requirements for advanced waste treatment (both phosphorous and nitrogen removal); and

    c. candidate sites have been reduced to only two available; the district is now in the process of negotiating for acquisition of the regional plant site.

Upper South Platte Watershed

Status of total maximum daily load allocation program

Upper South Platte Watershed steering committee

The Upper South Platte Watershed extends from the Strontia Springs Reservoir to the headwaters of the South Platte River in Park County (Figure 17). A major portion of this watershed is not located in the DRCOG region, but the water quality of this watershed does directly affect the water quality in Chatfield Reservoir. The Chatfield control regulation does define a specific phosphorus load attributable to the South Platte River as background. The Chatfield Watershed Authority will establish a phosphorus poundage target for the South Platte River below Strontia Springs Reservoir consistent with the total maximum annual load of phosphorus allowed in the Chatfield Reservoir. This target poundage will be recommended for incorporation into the control regulation.

No TMDLs in watershed

A water quality management effort has been initiated by a newly formed Upper South Platte Watershed steering committee. The program components include, but are not limited to, the following activities:

- Develop a strong public involvement program for the planning and implementation processes;

Develop an understanding of the watershed by identifying pollutant sources and constituents of concern related to the beneficial uses of the river;

- Prioritize water quality concerns with a focus on protection strategies and achieving the most benefit at the lowest cost;

- Identify and recommend implementation of effective management strategies to protect water quality, which may include structural and nonstructural best management practices, adaptive management strategies and strategies that consider objectives of regulations including the Clean Water Act, Source Water Assessment and Protection program and TMDLs; and

- Coordinate long-term water quality monitoring with existing monitoring efforts and identify additional targeted monitoring to evaluate the effectiveness of watershed management strategies.

Management agency

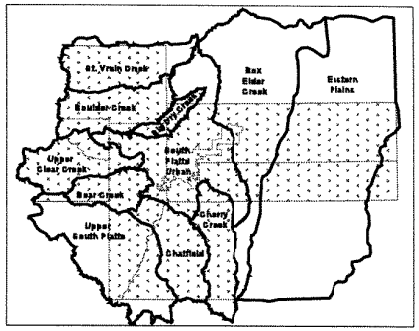
In the DRCOG portion of the Upper South Platte River Watershed , the only management agencies are Jefferson County and Douglas County. The two operating agencies are Mountain Water and Sanitation District and the Lost Valley Ranch. Table 27 identifies all of the wastewater treatment facilities located in the Upper South Platte River Watershed. Treatment facilities in the upper watershed discharge into the South Platte River. While only two of these facilities are covered by the *Clean Water Plan*, the remaining treatment facilities are important contributors to the nutrient load reaching the reservoir and will be listed in the *Clean Water Plan* for planning purposes.

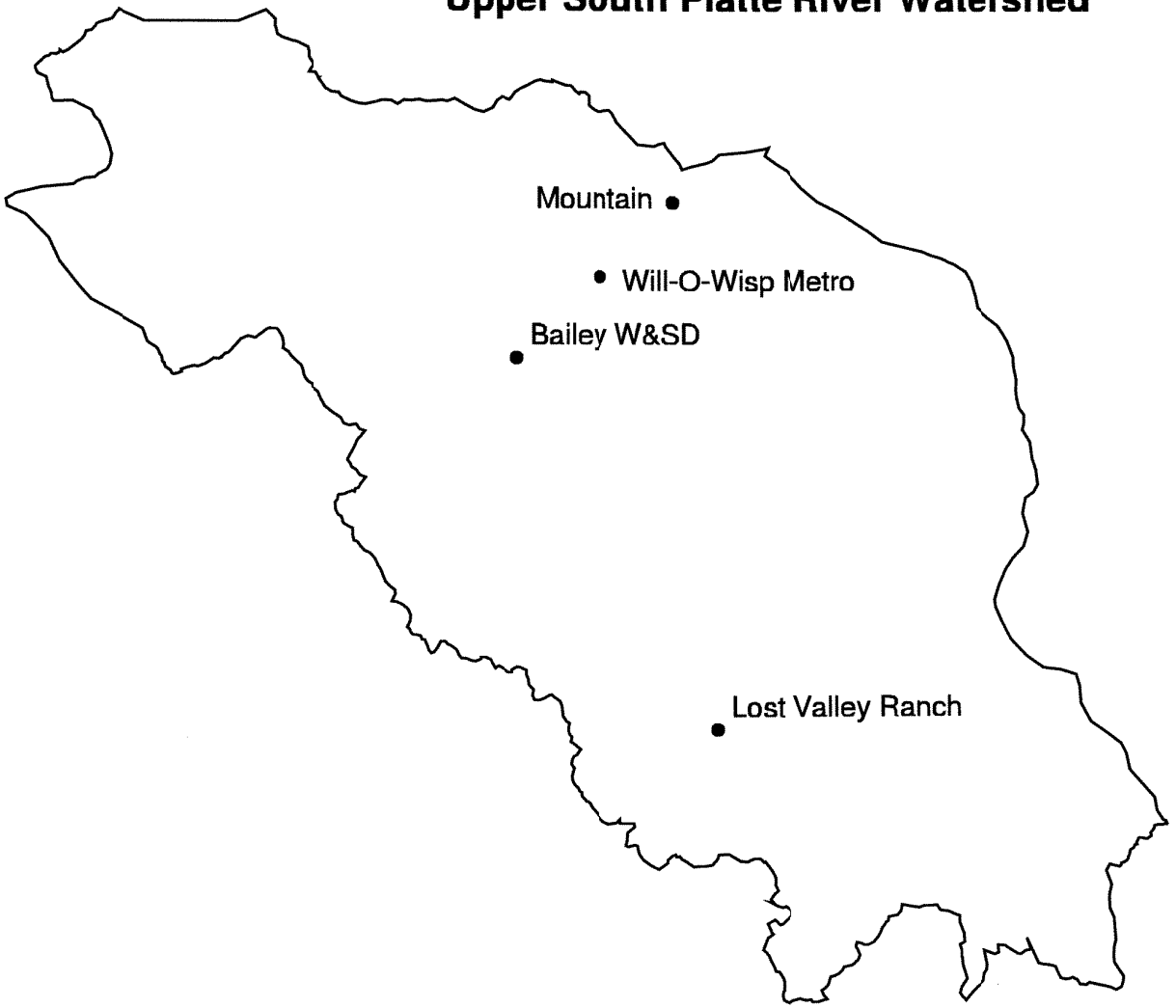
The 10 members of the Upper South Platte Watershed steering committee include Douglas County, Jefferson County, Park County, Teller County, Denver Water District, City of Aurora, Upper South Platte Water Conservancy District, center of Colorado Water Conservancy District, Soil Conservation District (Park County) and the state land board. The steering committee has primary supervision for the watershed management program. However, the steering committee is not a designated management agency. The steering committee has drafted a memorandum of understanding establishing the mission, goal, objectives and scope of the management program.

Wastewater management plans

The technical appendices to the *Clean Water Plan* will only contain detailed information about the two operating agencies in Jefferson County: Mountain Water and Sanitation District, and the Lost Valley Ranch. No other wastewater management plans are available for the watershed. Technical appendices will be maintained on an as-needed basis to reflect management agency activities.

Figure 17
Upper South Platte River Watershed





Upper South Platte River Watershed
Wastewater Treatment Facilities

N

0 5 10 Miles

DRCOG

Table 27 Upper South Platte Watershed Wastewater Treatment Facilities

Management (M) and Operating Agencies	Permit	Facility Size	Design Capacity		Estimated Date	
			Hydraulic (MGD)	Organic (lbs/day)	80% Capacity	95% Capacity
Alma, Town of	CO-0035769	Major	0.12	111		
Bailey Water & Sanitation District	CO-0020605	Major	0.07	125		
Elk Creek Elementary School	COG-620029	Minor	0.007			
Fairplay Sanitation District	CO-0040088	Minor	0.4	1200		
Lake George School	COG-620055	Minor	4.305			
Lost Valley Ranch	CO-0027219	Minor	0.015	50		
Mountain W&SD	CO-0022730	Major	0.1	112	2005	2010
Will-O-Wisp Metro District	CO-0041521	Major	0.06	138		
Windy Peak Outdoor Lab	COG-620030	Major	0.075			
Woodland Park, City of	CO-0043214	Major				

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The Technical Appendices of the *Metro Vision 2020 Clean Water Plan* are designed to be updated without requiring separate Board of Directors approval through the Metro Vision Plan Assessment Process. Changes to technical information and water quality management plans or strategies as listed in the appendices require approval by the Water Resources Management Advisory Committee. All technical appendix chapters can be updated as often as necessary, or at least annually. Changes to the delineated Wastewater Utility Service Areas must be consistent with the *Metro Vision 2020* urban growth boundary. All technical changes must be consistent with the policies, assessments and management programs contained in the *Metro Vision 2020 Clean Water Plan.*

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Bob LeGare
Bennett
David Dummar
Black Hawk
David Spellman
Boulder
William "Will" R. Toor
Bow Mar
Ted Baer
Brighton
Ken Mitchell
Broomfield
Bill Berens
Castle Rock
Donald Jones
Central City
Don Mattivi
Cherry Hills Village
Tim Roble
Columbine Valley
Ed Galavotti
Commerce City
Roland E. Cole
Edgewater
John Fox
Empire
(vacant)
Englewood
Alexandra Habenicht
Erie
Victor F. Smith
Federal Heights
Sharon Richardson
Georgetown
Carol Wise
Glendale
Joe Rice
Golden
Jan Schenck
Greenwood Village
Candy C. Figa
Idaho Springs
Bill Macy
Lafayette
Carolyn McIntosh
Lakewood
Linda Morton
Larkspur
(vacant)
Littleton
Doug Clark
Lone Tree
John O'Boyle
Longmont
Leona Stoecker
Louisville
Kevin Howard
Lyons
(vacant)
Morrison
Dick Scott
Nederland
Scott Bruntjen
Northglenn
Don Parsons
Parker
Lance Wright
Sheridan
Carol Jonkoniec
Superior
Susan Spence
Thornton
Margaret Carpenter
Westminster
Glenn Scott
Wheat Ridge
Ken Siler

Non-Voting Appointees
(vacant)

Metro Vision Policy Committee (June 1998)

Susan Beckman, Councilmember, City of Littleton
Bill Berens, Board Member
Joe Blake, Shea Homes
Brian Buzby, CoPIRG
Margaret Carpenter, Board Member
Tom Clark, Jefferson Economic Council
Roland Cole, Board Member
M. Michael Cooke, Board Member
Candy Figa, Board Member
Joyce Foster, Board Member
Paul Grundemann, Water Resources Management Advisory Committee
Mike Henry, Capitol Hill United Neighborhoods
Ellen Ittelson, Regional Planning Advisory Committee
Buz Koelbel, Koelbel & Associates
Lauren Martens, Colorado Environment Coalition
Polly Page, Board Member
Bob Poirot, Board Member
Joe Rice, Board Member
Pete Ross, ACCORD
Mike Segrest, Open Space Coordinating Committee
Vic Smith, Board Member
Leona Stoecker, Board Member
Paul Tauer, Mayor, City of Aurora
Marilee Utter, CITIVENTURE & Associates
Steve Wilson, Metro Home Builders Association

Craig Kocian, Arvada City Manager

Water Resources Management Advisory Committee (March 1998)

Adams County
Besharah Najjar
Arapahoe County
Cindy Edwards
Boulder County
Dale Case
Clear Creek County
Bill Snyder
Denver City and County
Terry Baus
Denver City and County
Rocky Wiley
Douglas County
Don Moore
Gilpin County
Mike Kirkegaard
Jefferson County
Mindi Ramig
Arvada
James Sullivan
Aurora
Kevin Wegener
Bennett
Evert Ackslan van Vrieslan
Black Hawk
(vacant)
Boulder
Robert “Ned” Williams
Bow Mar
(vacant)
Brighton
Ed Burke
Broomfield
Wayne Ramey
Castle Rock
(vacant)
Central City
(vacant)
Cherry Hills Village
Tim Gelston
Columbine Valley
(vacant)
Commerce City
Steve House
Edgewater
(vacant)
Empire
Mark P. Cucinella
Englewood
Stewart Fonda
Erie
Dave Stahl
Federal Heights
Stan Szabelak

Georgetown
(vacant)
Glendale
Lynda Hedl
Golden
Katie Fendel
Greenwood Village
Michael Vinson
Idaho Springs
Bill Macy
Lafayette
Mick Forrester
Lakewood
Vince Casteel
Larkspur
(vacant)
Littleton
Bob Deeds
Lone Tree
(vacant)
Longmont
Calvin Youngberg
Louisville
Tom Phare
Lyons
David Lock
Morrison
Dick Scott
Nederland
Ron Trzepacz
Northglenn
Kipp Scott
Parker
Frank Jaeger
Sheridan
Elmer Waldow
Superior
Bruce E. Williams
Thornton
Vic Lucero
Westminster
Tom Settle
Wheat Ridge
Walt Pettit
Arapahoe Water and Wastewater Authority
Newell Wright
Black Hawk/Central City Sanitation District
Lynn M. Venters
Centennial Water and Sanitation District
Paul Grundemann
Climax Molybdenum
Jay Jones

Conifer Sanitation Association
Boris S. Voukovitch
Coors Brewing Company
Tom Bueb
Denver Southeast Suburban Water and Sanitation District
Robert Emmons
Evergreen Metro District
Gerald Schulte
Fairways Metro District
Gerald Schulte
Forest Hills Metro District
Deborah McCoy
Genesee Water and Sanitation
Scott Jones
Inverness Water and Sanitation District
Patrick F. Mulhern
Martin Marietta Environmental Management
Willard R. Haas
Metro Wastewater Reclamation District
John Van Royen
Niwot Sanitation District
Gayle Packard-Seeburger
Parker Water and Sanitation District
Frank Jaeger
Plum Creek Wastewater Authority
Tim Grotheer
Public Service Company
(vacant)
Robinson Dairy
(vacant)
Rocky Mountain Remediation Services
Robert E. Fiehweg
Roxborough Park Metro District
Larry Moore
South Adams County Water and Sanitation District
Gregory Fabisiak
Stonegate Park Metro District
Wayne E. Monson
Superior Metro District
Holly Holder
Urban Drainage and Flood Control District
Ben Urbonas
West Jefferson County Metro District
Gerald Schulte