Cherry Creek Basin Water Quality Management Master Plan (Revised 1989)

CHERRY CREEK BASIN WATER QUALITY AUTHORITY

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WATER QUALITY MANAGEMENT

Master Plan

ORIGINAL - SEPTEMBER, 1985

REVISED - NOVEMBER, 1989

CHERRY CREEK BASIN

WATER QUALITY MANAGEMENT

Master Plan

(Revised 1989)

Cherry Creek Basin Water Quality Authority
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Englewood, CO 80111

Arapahoe County
Arapahoe Water & Wastewater Authority
City of Aurora
Cottonwood Water & Sanitation District
Denver Southeast Suburban Water & Sanitation District
Douglas County
City of Greenwood Village
Inverness Water & Sanitation District
Meridian Metropolitan District
Parker Water & Sanitation District
Stonegate Center Metropolitan District
Town of Castle Rock
Town of Parker

in cooperation with
Denver Regional Council of Governments
2480 West 26th Avenue, Suite 200B
Denver, Colorado 80211-5580

and

Colorado Department of Health
Water Quality Control Division
4210 East 11th Avenue
Denver, Colorado 80220

ABSTRACT

TITLE	Cherry Creek Basin Water Quality Management Master Plan (Revised 1989)
AUTHOR	Cherry Creek Basin Water Quality Authority
SUBJECT	This water quality plan for the Cherry Creek Basin defines point, nonpoint and in-reservoir phosphorous control strategies necessary to protect Cherry Creek Reservoir water quality.
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ABSTRACT	This water quality management plan presents a phosphorous control program for the Cherry Creek Basin. The intent of the control program is to limit the annual load of phosphorous entering Cherry Creek Reservoir to ensure that the 0.035 milligram per liter total phosphorous reservoir standard (as established by the Water Quality Control Commission) is achieved. The plan identifies the location, number and type of wastewater treatment facilities in the Basin and recommends a nonpoint control program capable of removing 50 percent of the annual nonpoint load. Specific phosphorous allocations are made for each point source discharge and a general plan for implementing strategies for water quality improvement for the Cherry Creek Reservoir is presented.

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THE 1985 MASTER PLAN EXECUTIVE SUMMARY

The 1985 Master Plan for water quality management in the Cherry Creek Basin was published as a joint effort by the Denver Regional Council of Governments, several local governments in the basin, state and federal agencies and water and sanitation districts in the basin. The plan really attempted to identify the most effective methods for protecting the water quality of Cherry Creek Reservoir, while complying with the 0.035 milligrams per liter (mg/L) total phosphorous standard adopted by the Colorado Water Quality Control Commission.

Strategies advocated in the 1985 Master Plan included developing estimates of nonpoint source and point source phosphorous loadings from activities in the basin. The activities were then assigned specific quantities to be either expected or allowed. Basically the "critical load" of phosphorous for the Reservoir was determined to be 14,270 pounds on an annual basis, which was then distributed as follows:

Source	Pounds of Phosphorous
Point Sources	2,310
Nonpoint Sources	10,290
Septic Systems	450
Industrial Sources	50
Background	1,170
Total	14,270

The 2,310 pounds available to point sources were then allocated to each of the 12 wastewater treatment facilities in the basin as follows:

Discharger	Annual Pounds
Arapahoe W & S District	354
Cottonwood W & S District	213
Denver Southeast Suburban W & S District	365*
Inverness W & S District	68
Meridian Metropolitan District	114
Parker W & S District	533
Stonegate Center Metropolitan District	53
Castle Rock (Mitchell Creek)	128
Castle Rock (Cherry Creek)	21
Castle Rock (McMurdo Gulch)	64
Castle Rock (Newlin Gulch)	86**
Rampart Range	160**
Total	2,159

* The present facility at Denver Southeast Suburban W & S District (DSESW&SD) utilizes 365 pounds of phosphorous annually. The 365 pound phosphorous allocation to DSESW&SD is temporary and shall be reduced to 213 pounds of phosphorous in 1990 or when DSESW&SD completes construction of their 1.4 mgd facility, whichever occurs first.

** The Castle Rock, Cherry Creek plant 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.

The 1985 Master Plan concluded with the following recommendations:

1. That local governments form a basinwide authority which would be responsible for implementing a point and nonpoint phosphorous control program which would include financing, constructing and operating responsibility for nonpoint sources of phosphorous.

2. That the basinwide authority be charged with responsibility for monitoring the existing water quality in the Reservoir and developing programs for improving that water quality over time with more sophisticated plans based on new or improved technologies.

The 1989 Master Plan (Revised)

The 1989 Plan responds to the 1985 Plan goals and recommendations. Bottom line, institutions were established, monitoring programs were carried forward, scientific data was gathered and professional studies were assembled and annual progress reports have been dutifully filed with the Colorado Water Quality Control Commission.

The purpose of the 1989 Master Plan is to bring up to date the progress made by what is now the formal basinwide institution, the Cherry Creek Basin Water Quality Authority, and to present the outline of an action program for the next five years for the Authority. The 1989 Plan specifically does not attempt to promote any changes in the 0.035 (mg/L) phosphorous standards for the Reservoir nor change any of the formulas for distribution of the "allowable phosphorous" allocations. The monitoring and scientific study effort to date seems to question the efficacy of the "phosphorous standard", but not enough conclusive data is present to warrant a request for change at this time.

One subtle change in program direction for the C.C.B.W.A. suggested in the 1989 Plan is a calculated shift from basin solutions to in-reservoir solutions. Scientific data gathered to date does suggest that certain characteristics of the Cherry Creek Reservoir, such as depth, bottom deposits, etc., may tend to respond most efficiently and effectively to in-reservoir techniques for improving water quality. Therefore, the 1989 Plan does suggest further types of studies and pilot programs be initiated to pursue this shift in emphasis.

Conclusion

Perhaps the one consistent and recurring thought presented in the 1989 Master Plan is that the ultimate solution to improving water quality in the Cherry Creek Reservoir is most probably a collection of various programs, such as wet dredging, wetlands, chemical treatment, best management practices, etc., all basically tailored to the Cherry Creek Reservoir. In other words, there does not exist a "one shot cure-all" that can simply be transferred to the Reservoir or the basin to magically restore the quality of the water in a reservoir which has been deteriorating since its construction in 1960.

I. INTRODUCTION

Governmental entities in the Cherry Creek Basin have been concerned about water quality in Cherry Creek Reservoir for a number of years. As a result, a basinwide cooperative effort was undertaken by the entities in 1984 in cooperation with the Denver Regional Council of Governments (DRCOG) to provide a water quality management Master Plan for the basin. The first water quality management plan was an update to the DRCOG Clean Water Plan.[1] The purpose of the first plan was to identify the most feasible and effective means for achieving the 0.035 milligrams per liter (mg/L) total phosphorous water quality standard in Cherry Creek Reservoir established by the Water Quality Control Commission (WQCC). The 0.035 mg/L total phosphorous standard was adopted on August 14, 1984 to protect the reservoir from accelerated eutrophication.

The Master Plan (1985) was the result of the cooperative efforts of DRCOG, state and federal agencies, and local governments in the Cherry Creek Basin. These parties formed a task force which was responsible for guiding the study and making final recommendations to the DRCOG Board of Directors and the WQCC. The task force effort and these recommendations were based upon intensive technical analyses documented in a supporting technical report.[2]

Subsequent to the adoption of the first Master Plan, the local governments in the Cherry Creek Basin formed an Authority by intergovernmental agreement and worked diligently to gain state approval of legislation to create the Cherry Creek Basin Water Quality Authority (CCBWQA). That goal was accomplished during the 1988 General Assembly with the Governor signing the Cherry Creek Basin Water Quality Authority Act, House Bill 1029, on April 28, 1988. The description of the intergovernmental authority and the statutory authority will be dealt with in detail in the Institution part of this Revised Master Plan.

The Revised Master Plan does not replace the need for individual facility plans. It identifies appropriate treatment methods, location of treatment facilities, nonpoint control strategies and a point source phosphorous allocation program. Implementation of the entire plan relies upon the newly created CCBWQA as an institutional mechanism responsible for ensuring that these recommendations are followed. The CCBWQA is also responsible for funding of certain elements of the plan in conjunction with other governmental units.

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[1]Denver Regional Council of Governments, Clean Water Plan, 1984 Update, September, 1984, Denver, Colorado.

[2]Denver Regional Council of Governments, Cherry Creek Basin Water Quality Management Master Plan Technical Report, Denver, Colorado.

The Revised Master Plan as presented serves two functions. First, it should be used as a planning tool for addressing water quality issues in the basin. Second, part of the document is prepared in a format suitable for adoption by the WQCC. This latter function was requested by the WQCC and incorporated in the original Master Plan for use in acting upon site applications, discharge permits, nonpoint control regulations and the point source phosphorous allocation program.

Status of Rule Adoption

As noted previously, this Revised Master Plan is not recommended for adoption as rules for the Cherry Creek Basin by the WQCC. It is anticipated that this revised plan will be adopted by DRCOG and the WQCC in the same format as the original Master Plan.

It is recommended that the presently adopted rules (5 CCR 1002-19) will continue to focus on the main issues which relate to controlling phosphorous in the basin. The topics which were adopted as rules and subsequently included in 5 CCR 1002-19 are:[1]

1. Authority. Recognizes the state statutes C.R.S. 1973, 25-8-205 which authorize the WQCC to promulgate water quality control regulations.

2. Definitions. Specific water quality terminology used throughout the regulation is defined.

3. Wasteload Allocation for Total Phosphorous Discharge. The maximum annual phosphorous loads from individual sources are defined.

4. Allowed Phosphorous Discharge (lbs./yr.). Each point source discharger in the basin is allocated a maximum annual phosphorous poundage limit. An annual poundage limit is also placed on septic systems and industrial dischargers. A reserve pool of phosphorous is also maintained for emergency purposes.

5. Municipal, Domestic and Industrial Effluent Limitations. Maximum daily phosphorous effluent concentrations are defined as well as a 30-day average effluent design concentration.

[1]See Appendix C.

6. Control of Nonpoint Sources. A nonpoint control strategy is outlined which establishes a control program to remove 50 percent of the annual nonpoint phosphorous load.

7. Monitoring of Phosphorous. A basinwide monitoring program is required to determine that the point and nonpoint sources are in compliance with the regulation and to report on the water quality status of Cherry Creek Reservoir.

8. Commission Review. The WQCC shall periodically review the regulation and, if necessary, adjust the regulation so that the phosphorous control program is effectively maintaining the reservoir phosphorous standard.

The following chapters present the detailed recommendations relevant to the phosphorous control program in the Cherry Creek Basin. Implementation of the control regulation is necessary to preserve the beneficial uses of Cherry Creek Reservoir while at the same time providing for the growth and development anticipated in the basin.

The public uses of the Cherry Creek Reservoir are principally focused on the recreational desires of the Denver Metropolitan Area population. The Colorado Division of Parks and Outdoor Recreation is responsible for operating the State Park which includes approximately 3,500 acres of land surrounding the Reservoir and the surface area of the Cherry Creek Reservoir. The Park is a multifunctional facility with uses ranging from general swimming and recreation to water skiing, camping, jogging, bicycling, horseback riding, fishing and rifle range activities. Recreational activities have remained rather stable over the past few years with the following visitor days recorded by the Division:

Cherry Creek Reservoir

Year	Visitor Days
1987-88	1,279,242
1986-87	1,300,019
1985-86	1,308,911
1984-85	1,279,922

Other uses of the Reservoir include the urban amenity value of the lake and minor water storage rights in the lake.

II. BASIN DEVELOPMENT

The type and rate of growth in the Cherry Creek Basin will have a direct impact on the water quality of Cherry Creek Reservoir. In order to determine the extent of the impact, it was necessary to estimate current and future levels of population, employment and wastewater flow. These values were used to predict future phosphorous loading to the reservoir from both point and nonpoint sources. A "critical load" occurs when loading from wastewater plants, stormwater runoff, and background sources will equal the standard established for the reservoir. Certain point and nonpoint treatment assumptions utilized in the Master Plan were also used in this update to define critical load. The purpose of the population and employment projections is to relate development activities to the critical loading. Using models of in-lake phosphorous relationships (Canfield-Bachmann) and stormwater runoff phosphorous and projections of wastewater flow concentrations and travel times to the reservoir, a "critical load" was determined.

The projections reflect the anticipated land use in the basin. Land use information used in this plan was provided by the local governments as of June, 1984 with revised estimates as of September, 1989 and includes information on Newlin Gulch development as supplied in March, 1985. Newlin Gulch represents an area that will urbanize, but will probably be part of the Castle Rock system. Land use information on Newlin Gulch reflects the expected land use pattern at full build-out and does not necessarily reflect existing zoning or platting. This land use information was then translated into projections of population, employment and wastewater flow for the years 1990, 2000, and 2010. It recognized that the assumptions used to develop the land use will change with time. The plan is flexible enough to allow these changes through the annual plan update process if requested by the management agency. Details of the methods used to convert land use information into population and employment appear in the technical report.[3]

Normally, projections of growth are used to determine wastewater treatment facility sizing and staging for discrete years (1990, 2000). Since treatment facilities in the Cherry Creek Basin will be limited to a phosphorous load allocation which is regulated by a regularly reviewed basinwide phosphorous limit, projections of growth at the discrete years becomes an ineffective way to plan for sizing and staging. The controlling factor for sizing and staging is the critical point source loading and the individual facility phosphorous allocation. The population and employment served by a facility is determined by the phosphorous allocation. To the extent that a facility can remove more nonpoint phosphorous or treat wastewater to a higher degree, it can serve more population. This concept is discussed in subsequent chapters in this plan.

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[3]Ibid.

Land Use

The development pattern expected to occur in the Cherry Creek Basin is shown in Figure 1. Based on the information provided by the local governments, open space will continue to be the predominant use in the basin. Open space and agricultural uses which will cover 102,000 of the 246,000 acres in the basin. However, most of this open space will be concentrated in the southern portion of the basin extending into El Paso County. At this time, neither Douglas County nor El Paso County foresees any development other than some large lot residential areas south of Franktown.

North of Franktown, the development pattern is expected to become predominantly urban. This change from agricultural uses is already under way with much large lot development already in place. The future plan suggests that large lot areas will occupy the eastern ridge and portions of the western ridges of the basin. Urban residential and commercial development is expected to occur in the valley areas.

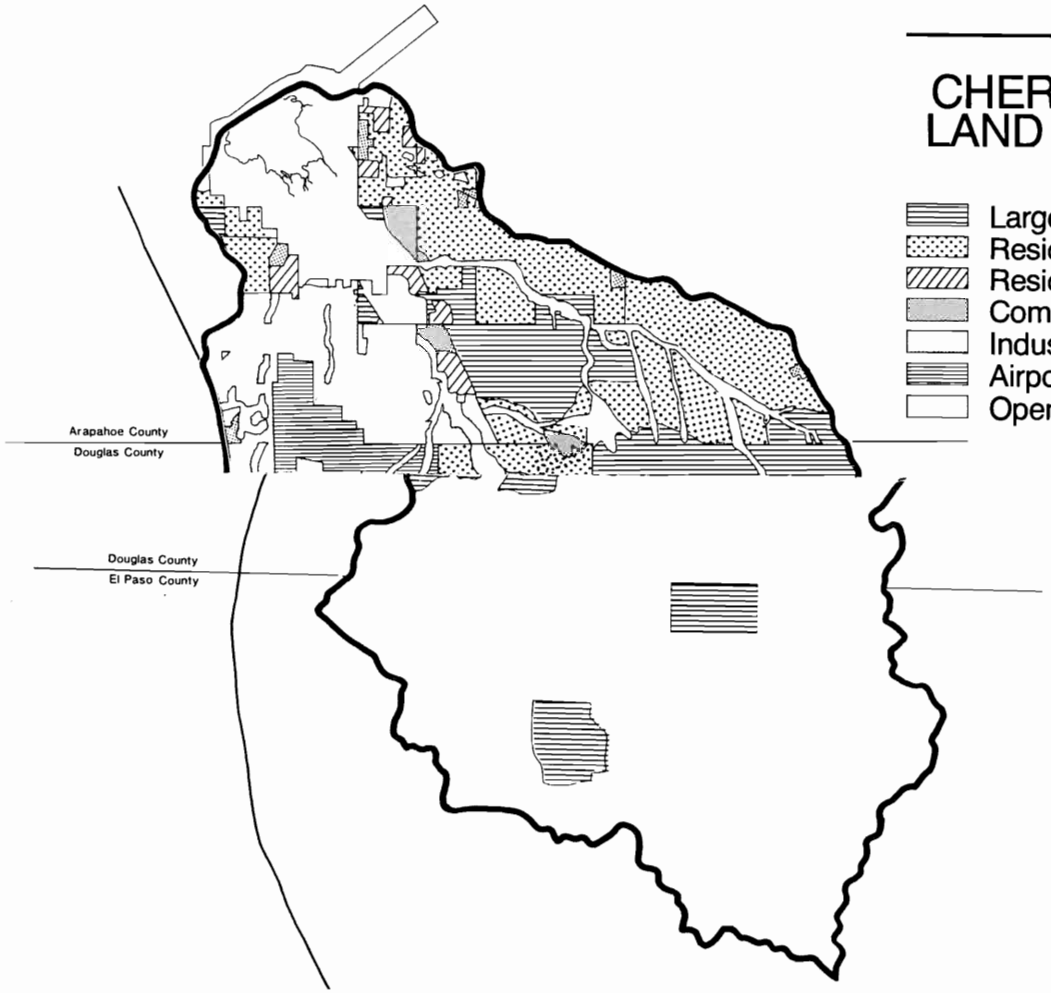
This urbanized area is generally separated into office-commercial-industrial development at the extreme northern end of the basin and residential areas extending from the Arapahoe County line south to Castle Rock. A non-residential buffer has been recognized at the Centennial Airport. Another nonresidential area also extends along I-25 and a similar area may develop along E-470.

Projections of Population and Employment

The 1985 Master Plan took the land uses as defined in the previous section and distributed the development over 30 subbasins within the Cherry Creek Basin. That staging produced land use information projected population, employment and wastewater flows for 1990, 2000 and 2010. Total population projections compared to present population estimates by both the Denver Regional Council of Governments and local officials follows in Table 1:

FIGURE 1

CHERRY CREEK BASIN LAND USE AT ULTIMATE BUILD-OUT



- Large Lot Residential (≤1 D.U./AC.)
- Residential (>1 D.U./AC.)
- Residential (>11 D.U./AC.)
- Commercial (Retail & Office)
- Industrial (Light Industry & Office)
- Airport Property
- Open Space (Park, Flood Plains & Agriculture)

Table 1

Comparison of 1985-1989 Population Projections

	1990	2000	2010
1985 Master Plan	90,400	187,640	301,800
DRCOG (1989)	73,690	134,240	186,000
Local Officials (1989)	73,690	141,237	223,667

The thirty subbasins used in the 1985 Plan are no longer compatible with the regional accounting for population. Therefore, Table 2 contains the forecasts of total population for 1990, 2000 and 2010 for each of the subareas of the basin. Basinwide population is expected to double by 2000. The growth rate slows slightly during the first decade of the 21st century.

For water quality planning the number of persons in three categories is important: sewered population, large lots with septics and population sewered by a facility discharging outside of the Cherry Creek Basin. This split more accurately defines that population which would be contributing directly to a point source loadings (sewered population) and the population which would be using septic systems. The population served by a wastewater treatment facility located outside of the Cherry Creek Basin will not contribute to Cherry Creek point source loads (all population will contribute to nonpoint source loads, see Chapter V). The population sewered out of the basin will be located primarily on the east and west sides of the reservoir and will be sewered through Metropolitan Denver Sewage Disposal District No. 1, and population near Castle Rock will be sewered at Castle Pines. Table 2 presents the DRCOG projections for the subsets.

Population projections are at best based on an imprecise science. The decision to present both the 1985 estimates and the 1989 estimates was to illustrate how that, within the short term, factors such as the economy of the area will tend to drive estimates to lower numbers. The 1985 numbers were based on a more detailed subbasin capacity and are, therefore, maintained for the 1989-1994 period. The updating process in 1994 will have both the 1990 census tract information and a ten-year trend line to project estimates for the next century.

Table 2

(DRCOG)

Population Estimates

Sewered In Basin	1990	2000	2010
Arapahoe	2,740	5,130	8,830
CR/CP**	1,280	2,400	3,640
Cherry Creek	0	960	1,370
Cottonwood	3,760	3,880	4,540
Denver Southeast	5,400	7,030	8,160
Inverness	0	0	0
Meridian	0	0	0
Newlin Gulch	0	2,910	5,050
Parker	7,560	20,370	33,360
Rampart Range*	0	4,020	6,940
Stonegate*	480	1,710	2,290
Subtotal	20,740	46,700	71,890
Sewered Out-of-Basin			
Metro-Denver Basin	7,490	12,280	13,030
Metro-Sand Creek	24,780	36,420	44,260
Castle Pines North	1,180	2,770	4,220
	33,450	51,470	61,510
Subtotal	54,190	98,170	133,400
*Unsewered - Septic	19,500	36,070	52,600
Total	73,690	134,240	186,000

*Unsewered Septic are 1985 estimates.
**Castle Rock/Castle Pines

Table 3 presents the local government projections for these values.

Table 3

(Local Projections)

Population Estimates

	1990	2000	2010
Arapahoe	2,740	4,919	8,844
CR/CP**	1,280	3,510	7,000
Cherry Creek	0	1,020	2,630
Cottonwood	3,760	5,500	7,150
Denver Southeast	5,400	9,840	23,140
Inverness	0	0	0
Meridian	0	0	0
Newlin Gulch	0	2,640	7,460
Parker	7,560	21,710	32,960
Rampart Range	0	9,780	19,860
Stonegate	480	5,480	6,520
Subtotal	20,740	58,919	109,044
Sewered Out-of-Basin			
Metro-Denver Basin	7,490	10,126	12,065
Metro-Sand Creek	24,780	32,707	44,632
Castle Pines North	1,180	3,415	5,326
	33,450	46,248	62,023
Subtotal	54,190	105,167	171,067
*Unsewered - Septic	19,500	36,070	52,600
Total	73,690	141,237	223,667

*Unsewered Septic are 1985 estimates.
**Castle Rock/Castle Pines

The population sewered out of the basin will grow very slowly. In addition to the area served through the Metro District, a portion of the Castle Pines development lies in the Cherry Creek Basin but is sewered through a plant in the Plum Creek Basin. The Town of Castle Rock is in the process of changing some of the subbasin flows for system planning purposes. The effect of those changes will not be known until some time in the future and will not affect the allocation numbers at this time.

Increases in the population served by septic systems could be significant. This is a trend that is being monitored to determine the impacts of numerous septic systems. Large subdivisions, dependent upon septic systems, have not been approved unless the developers can prove that (1) the septic systems can meet the effluent concentration proposed for wastewater treatment systems, and (2) that the systems in total will not exceed the phosphorous allocation of 450 pounds/year. Additionally, routine inspections and maintenance of septic systems may be necessary.

Employment is expected to be a major growth element in the basin, but estimates in the 1985 plan have been reduced by both DRCOG and local government for this revised plan in 1989. Tables 4, 5 and 6 present the employment projections.

Table 4

Comparative Estimates of Employment

	1990	2000	2010
1985 Plan	59,340	162,790	300,020
1989 Local Government	16,220	44,010	63,930
1989 DRCOG	16,220	41,620	68,480

Table 5

Employment Projections

(DRCOG)

	1990	2000	2010
Arapahoe	2,860	12,510	19,910
CR/CP*	180	470	710
Cherry Creek	0	200	250
Cottonwood	440	830	1,280
Denver Southeast	740	760	820
Inverness	7,890	10,470	10,900
Meridian	250	1,730	3,520
Newlin Gulch	0	140	240
Parker	1,300	4,690	8,350
Rampart Range	0	1,480	2,890
Stonegate	120	830	1,750
Subtotal	13,660	33,280	48,870
Sewered Out-of-Basin			
Metro-Denver Basin	420	3,260	5,910
Metro-Sand Creek	2,110	4,980	13,480
Castle Pines North	30	100	220
Total inc. Un-sewered	16,220	41,620	68,480

*Castle Rock/Castle Pines

Table 6

Employment Projections

(Local Government)

	1990	2000	2010
Arapahoe	2,860	12,510	19,910
CR/CP*	180	470	720
Cherry Creek	0	230	330
Cottonwood	440	830	1,280
Denver Southeast	740	840	1,070
Inverness	7,890	10,470	15,000
Meridian	250	4,000	12,000
Newlin Gulch	0	150	310
Parker	1,300	4,690	8,850
Rampart Range	0	1,480	2,890
Stonegate	120	830	1,750
Total	13,660	35,670	44,520
Sewered Out-of-Basin			
Metro-Denver Basin	420	3,260	5,910
Metro-Sand Creek	2,110	4,980	13,480
Castle Pines North	30	100	220
Total inc. Un-sewered	16,220	44,010	63,930

*Castle Rock/Castle Pines

III. BASIN PHOSPHOROUS LIMITATION AND ALLOCATION

The 0.035 mg/L total phosphorous standard on Cherry Creek Reservoir limits the maximum phosphorous loads annually in the reservoir. The standard was proposed to be achieved by controlling the amount of phosphorous allowed into the reservoir. This amount is termed the "allowable annual reservoir phosphorous loading." The first Master Plan assumed that there were three primary sources of phosphorous-point, nonpoint, and background and the Plan only addressed control of the point and nonpoint sources.

Sources of the annual reservoir phosphorous load are the natural and man-made conditions in the Cherry Creek Basin, specifically stormwater runoff (nonpoint sources) and wastewater treatment facilities (point sources). The annual phosphorous load into the reservoir is largely the result of the stormwater runoff or nonpoint sources of phosphorous but, as conditions in the basin change and more development occurs, treated wastewater will add more phosphorous. The increase in developed land or urbanization will also create an increase in the quantity of stormwater which reaches the reservoir. In addition to the annual phosphorous loads into the reservoir, there may be a substantial phosphorous load in the reservoir sediments which, depending on reservoir conditions, is available for algae growth. Benthic respirometer studies in the reservoir in 1988 indicated that the phosphorous loads from sediments may exceed the annual phosphorous loads from point and nonpoint sources.[4] Also, the analysis of in-lake treatment options (1988) determined that, even if nutrient loadings were completely eliminated, the reservoir would have sufficient in-reservoir nutrients to feed the eutrophication of the reservoir for several years.

Allowable Annual Reservoir Phosphorous Loading

Consistent with the original Master Plan, the annual reservoir phosphorous loading from point and nonpoint sources must still be controlled.[5] As noted above, point and nonpoint sources increase as land use changes and growth occurs. It was estimated that, in 1982, 5,180 pounds of phosphorous was contributed to the reservoir. Most of this loading (77 percent) came from nonpoint sources with the remainder due to background sources. Less than 1.0 percent of the 1982 load was attributable to point sources due to the relatively small quantity of wastewater produced. The expected quantity of point source phosphorous is shown in Table 7 and the anticipated nonpoint quantity in the basin appears in Table 8.

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[4]1988 CCBWQA Annual Report.

[5]Denver Regional Council of Governments, Cherry Creek Reservoir Clear Lakes' Study, April, 1984, Denver, Colorado

Table 7

Projected Annual Point Source Loading

	1990	2000	2010
Phosphorous Load (pounds)	657	2,310	4,210
Volume (acre-feet)	5,153	16,132	29,352

Table 8

Projected Annual Nonpoint Source Loading

	1990	2000	2010
Phosphorous Load (pounds)	10,835	21,531	43,209
Volume (acre-feet)	3,675	10,997	26,557

Although the original Master Plan projected background loading to reservoir, estimated at 1,170 pounds of phosphorous per year, this is not included in this Master Plan. The benthal respirometer and in-reservoir studies indicate that the prior estimates of background phosphorous loads, especially those attributable to reservoir sediments, may have been significantly underestimated. However, the data collected is not sufficient to ascertain a true background loading level.

The original Master Plan utilized projections of annual phosphorous loads to determine the resulting in-lake phosphorous concentration. The Canfield/Bachmann in-lake phosphorous model was used for these calculations.[6] This relationship between annual phosphorous loading and the in-lake phosphorous concentration was used to determine the annual allowable reservoir phosphorous loading. By incorporating the reservoir phosphorous standard (0.035 mg/L) into the Canfield/Bachmann equation, an annual phosphorous load was predicted to protect the in-lake standard. However data since 1984 indicates that the Canfield/Bachmann model and [illegible]/Bachmann model do not predict or model the phosphorous relationships in the reservoir.

[6]Ibid.

Critical Point Source Loading

The method used to determine the critical point source load is documented in the 1985 technical report.[7] Once the critical point source is determined, the critical nonpoint source can also be identified. The critical point source load, critical nonpoint source load and the background loading were based on the following assumptions:

1. The point source load is based on the number of treatment systems and the mix of wastewater treatment methods identified in Chapter V. Any changes in the number of facilities, type of treatment, or quantity of wastewater generated will change the critical point source loading limit in addition to changing the allowable annual reservoir phosphorous load.

2. The nonpoint source load is dependent upon the land use forecast and associated runoff coefficients. The land uses recognized in this planning effort include large lot residential, urban residential at two different densities, commercial industrial, airport property and open space. The actual rate and distribution of growth may be different resulting in different nonpoint loading rates. Any significant changes in the nonpoint contribution, as measured through an annual monitoring program, will change the annual critical nonpoint loading and the allowable annual phosphorous limit.

3. The critical nonpoint source loading includes 450 pounds of phosphorous from septic systems. An intensive study to more precisely define the contribution from septic systems has been undertaken by the Authority and Tri-County Health Department. The plan recognizes an annual loading of 450 pounds from this source regardless of the population served by septic systems. It also recognizes 50 pounds for industrial dischargers.

4. The 1,170 background source loading is considered to represent an average condition. If this amount changes, its effect on the allowable annual phosphorous limit will need to be determined. In any event, an increase in the uncontrollable background loading in any one year which is the result of an act of nature should not jeopardize or reduce the point source allocation.

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[7]Denver Regional Council of Governments, Cherry Creek Basin Water Quality Management Master Plan Technical Report.

The allocation process needs to recognize two other contributors of phosphorous, septic systems and industrial dischargers. Although it was not possible to quantify the exact contribution of septic system phosphorous, information suggested an appropriate allocation would be 450 pounds. This allocation is considered to be a part of nonpoint load. Although there may not be any industrial dischargers presently permitted in the basin, phosphorous is allocated to this source since industrial dischargers may operate within the basin independent of domestic wastewater facilities. Therefore, a nominal quantity of 50 pounds has been allocated to this point source. Table 9 displays the critical phosphorous loading from all sources.

Table 9

Critical Loading From All Sources (1985)
(Pounds Per Year)

Point Sources	2,310
Nonpoint Sources	10,290
Septic Systems	450
Industrial Sources	50
Background	1,170
Critical Load	14,270

Surface Hydrology

The surface hydrology part of the report actually consisted of reviewing previously collected and written data to determine the accuracy and adequacy of the assumptions used in the 1985 Master Plan. The following is a summary of the analysis and limitations of the 1985 assumptions:[8]

1. The models developed in the original Denver Region Urban Runoff Program (DRURP) study were developed based on small urban basins, and are not applicable to large undeveloped basins greater than 1,000 acres. Therefore, the models may not accurately forecast the Cherry Creek Basin which contains over 285 square miles.[9]

2. Rainfall duration and intensity were not considered, only total depth of rainfall for any time period separated by twelve hours of no precipitation.

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[8]Leonard Rice Consulting Water Engineers, October, 1989, Report on Surface and Subsurface Hydrology in the Cherry Creek Basin.

[9]Denver Regional Council of Government, September, 1983, Urban Runoff Quality in the Denver Region.

3. Daily rainfall records were analyzed. The Urban Drainage & Flood Control District (UDFCD) is currently investigating hourly records of storm-size distribution and frequency as indicators of runoff.

4. Officials at UDFCD have stated that storms in urban areas have to total more than .08 to .15 inches in rainfall depth for runoff to occur. Inclusion of the two lower classifications in Cherry Creek rainfall may overestimate loads and runoff in developed basins.

5. The accuracy of runoff prediction decrease for basins having less than 10 percent PEI (Percent Impervious Area). According to the models for natural grasslands (PEI = 0), no runoff occurs for rainfall depths less than 1.5 inches. A majority of the Cherry Creek Basin is in natural grasslands.

PEI 2.

6. Calibration of the runoff models to the Cherry Creek Basin required scaling factors that changed predicted results by orders of magnitude in either direction depending on the subbasin.

7. It was assumed that the Cherry Creek Dam precipitation gage was representative of the reservoirs tributary area. Annual precipitation at Cherry Creek Dam averaged 18.95 inches for the period 1969-1982. Cherry Creek Dam lies within the preferred South Suburban thunderstorm track as identified in Figure 21 of Reference.[10]

   Average annual precipitation of the Parker 6E weather station is 13.4 inches for the period 1941-1970. Hourly records are also available at this station. Therefore, Cherry Creek Dam precipitation measurements should not have been applied to all lands within the Basin.

8. There are 384 square miles in the basin. The annual runoff volume predicted for current conditions is 685 AF (1982) and 870 to 1,860 AF for 1985.

   Historic gaged flows of Cherry Creek near Melvin (336 mi^{10}) located at Arapahoe Road, average 8,500 AF per year for the period 1941-1969, and 1985. Cherry Creek near Franktown (169 mi^{10}) records show an average of 6,800 AF for the period 1941-1986.

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[10]Ibid.

9. The DRURP study stated that extreme caution should be used in predicting runoff amounts for storms greater than 1.5 inches total depth.

While the 1985 approach represented the best available at the time, considering the lack of data and other constraints, it clearly has limitations that are important to the determination of phosphorous loading in Cherry Creek Reservoir. Refinements to the methodology and improvement of the phosphorous loading estimates could possibly be achieved by analyzing the basin specific data collected since adoption of the 1985 Master Plan.[11]

The CCBWQA Board will review the report recommendations and pursue, over the next five year planning period, more precise interpretations of the later years data to see if adjustments should be made to runoff assumptions affecting the phosphorous loading of the reservoir.

[11]Ibid.

IV. UPDATE OF RESERVOIR CONDITIONS

Basin Hydrology

The 1985 Master Plan did not contain specific information on the surface and subsurface hydrology. The Board of Directors of CCBWQA retained consultants investigate both the surface and subsurface hydrology. The following sections present a summary of the report.[12]

Geologic Setting

The Cherry Creek Alluvium is deposited in a valley incised into the Denver Formation. The alluvium consists of stream deposited, unconsolidated, sand, gravel, cobbles, silt and clay. The alluvial channel is 3,000 to 6,000 feet wide between Parker and Cherry Creek Dam. U.S. Geological Survey lithologic well logs were used to create cross-sections of the alluvial channel. The cross-section at Arapahoe Road is typical of the aquifer. The cross-section shows that the paleochannel is up to 110 feet thick and that the aquifer can be subdivided into four geological units. In general, all of these units exhibit a fining upwards sequence with the coarsest, most permeable material at the base of the unit and the finer less permeable material at the top of the unit.[13]

Cherry Creek Dam

Cherry Creek Dam is an earth-fill dam constructed by the U.S. Army Corps of Engineers as a flood control structure. Beneath the dam, over most of its length, all the unconsolidated material was excavated down to bedrock and replaced with impermeable material, to form a cut-off trench. The depth of the alluvium exceeds the depth of the cut-off trench at two locations by as much as 50 feet. These two zones allow ground water to flow beneath the dam and to continue downstream in the Cherry Creek Alluvium.[14]

The dam is designed to allow for this underflow. To alleviate high hydrostatic conditions at high water conditions in the reservoir, the U.S. Army Corps of Engineers constructed 14 pressure relief wells in the alluvium across the toe of the dam. These pressure relief wells are connected by a drain pipe at 5,497 feet elevation. If the water level in the alluvium rises above that level, it drains by gravity to the stream. This removes hydrostatic pressure before it can build to dangerous levels at the toe of the dam.

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[12]Leonard Rice Consulting Water Engineers, October, 1989, Report on the Surface and Subsurface Hydrology in the Cherry Creek Basin.

[13]Appendix D.

[14]Appendix D.

The U.S. Army Corps of Engineers monitors the water level changes in these and other wells. Most of the water table fluctuations are cyclic and seasonal, showing a definite drop during irrigation season and rebound during the winter and spring. These cycles are caused by pumping of irrigation wells on Kennedy Golf Course. The closest golf course well is only 380 feet from the nearest pressure relief well. Only during reservoir filling events do the water levels diverge from the seasonal pattern. When the reservoir quickly rises by 5 or 10 feet, the wells which are drilled directly into the deep paleochannel rise very quickly. The other wells also are affected by the rise, but much more slowly. These changes demonstrate that the ground water flow under the dam is directly related to the storage behind the dam.

Subsurface Hydrology

The following conclusions were presented by the report:[15]

1. Approximately 2,400 acre-feet per year of ground water flows north towards Cherry Creek Reservoir in the saturated alluvium.

2. Because the Cherry Creek Dam cut-off trench does not go completely to bedrock, approximately 4,400 acre-feet per year of water flows beneath the Cherry Creek Dam. Of this total, 2,400 acre-feet is provided by natural ground water underflow, and 2,000 acre-feet is provided by recharge from the reservoir.

3. Ground water in the Cherry Creek Alluvium migrates at a rate of approximately 630 feet per year. At this flow rate, the ground water travel time from Parker to the Cherry Creek Dam (9 miles) is 76 years.

4. Ground water flowing in the alluvium is not intercepted by Cherry Creek Reservoir; therefore, phosphorous in the ground water does not impact the reservoir.

5. Because the reservoir recharges the ground water, it may either a) add phosphorous to the ground water downstream of the reservoir, or b) dilute the phosphorous in the ground water and concentrate it in the reservoir. Insufficient data are available to evaluate these alternatives.

6. Because Cherry Creek and the aquifer are hydraulically connected, changes in water table elevation could change Cherry Creek from a losing to a gaining stream. This could affect runoff characteristics in the basin and alter the phosphorous levels in the Cherry Creek Reservoir.

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[15]Leonard Rice Water Engineers, October, 1989, Report on Surface and Subsurface Hydrology in the Cherry Creek Basin.

7. Changes in the historic pumping pattern in the alluvium could change Cherry Creek from a losing to a gaining stream over part or all of its lengths. If this occurs, the phosphorous loading to Cherry Creek could increase or decrease depending upon the changes in ground water elevation.

The CCBWQA Board should, in conjunction with some of the member entities, continue with the study of the groundwater quality and movement during the next five year planning period to prove or disprove any effect on the water quality in the reservoir.

Preliminary Investigation

The 1985 Master Plan tried to identify levels of algae growth that would be objectionable to users of the water, and detrimental to fish life. The Water Quality Control Commission, following public hearings on this study, set a standard for algae growth. The chlorophyll-a level (an indicator of algae growth) was set at 15 micrograms per liter. The Master Plan at the same time had hypothesized that algae growth in the lake was limited or could be limited by the amount of available phosphorous in the water. Hence, by controlling and limiting this phosphorous, algae growth could be controlled. A relationship between chlorophyll-a and phosphorous was developed and a standard was set on phosphorous at 35 micrograms per liter. In theory this would ensure compliance with the chlorophyll-a standard.

Since 1985 the Cherry Creek Basin Authority (CCBA) has embarked on a program of monitoring the stream discharges tributary to the lake to determine phosphorous loading and to monitor quality of water in the lake to phosphorous and chlorophyll-a. This program has been continued on a modified basis by the CCBWQA since 1988. The records of this program reveal that over the past five years the phosphorous standard has been exceeded on occasion and there seems to be a trend for increasing phosphorous levels in the lake with time. During that same time period, the chlorophyll-a standard has seldom been exceeded. The reports have noted that the theoretical relationship between phosphorous and chlorophyll-a presented in the Master Plan are subject to variances and that there obviously are other items that are directly affecting the production of algae. Last year the Authority contracted with Camp, Dresser and McKee, Inc. and Riverside Technology, Inc. to take a harder look at the limnology of Cherry Creek Reservoir; that is, the biological and chemical processes that are taking place within this lake system. This study developed some very significant conclusions. The most significant of these are as follows:

1. Algae growth in the reservoir is not phosphorous limited. There is an abundance of phosphorous in the reservoir at any one time. The phosphorous is available in great abundance in the colloidal material in the sludge layer on the bottom of the reservoir. This colloidal material is a very fine material that is readily resuspended into the water column. Since Cherry Creek Reservoir is a very shallow reservoir, winds of less than 10 mph can cause turbulence of the lake's

waters down to the deepest parts of the reservoir and this turbulence alone can cause resuspension of the colloidal material, thereby providing a high concentration of phosphorous to the water column. In the absence of wind, power boats on the reservoir readily cause the same phenomena.

Since phosphorous is available in concentrations that would support much greater growth of algae, the researchers completed some investigations to determine what factors are limiting that algae growth. These factors appear to include light limitation, whereby the mixing of these colloidal materials into the lake's waters reduces the transparency of the lake and, hence, light does not penetrate deep enough in the water to produce higher levels of algae growth. In addition, it appears that nitrogen might be a limiting factor; however, since nitrogen is available in the atmosphere and some of this algae is floating, it is impossible to limit the availability of nitrogen to the system.

Hence, most importantly the study found that the lake has plenty of available phosphorous and that, even if all sources of phosphorous to the reservoir were completely eliminated, algae growth would continue at high levels for a long period of time and the lake would continue to eutrophy much at its present pace.

2. Assuming that the reservoir has a limited amount of nutrients in its sediments, the objective has been to limit the total poundage of phosphorous delivered to the reservoir in any one year to approximately 14,000 pounds. This was estimated to be the amount of nutrients that could be received by the reservoir and yet maintain phosphorous at 35 micrograms per liter. Under this scenario, the phosphorous loading rate equals about 1.88 grams per square meter per year of total phosphorous delivered to the reservoir. This is after 50% of the loading in the basin is removed from storm water.

In addition, the Authority's focus should shift to an In-reservoir Program during the next few years which will investigate the use of chemicals for algae blooms and wet dredging to reduce existing in-reservoir phosphorous loads. This Revised Master Plan contemplates resources directed at supporting the recommended investigation.

V. NONPOINT SOURCE CONTROL

Annual nonpoint source phosphorous loads to Cherry Creek Reservoir may be significant. Because the nonpoint is a high proportion of the annual phosphorous load, it is necessary to control this source of phosphorous in order to protect the beneficial uses of the reservoir while the basin develops.

Existing Situation

Nonpoint source controls were provided in the 1985 Master Plan. Requirements for nonpoint source controls are included in Department of Health Colorado Regulations 5 CCR 1002-19(4.2.6) (1985, 1989). The following is excerpted from 5 CCR 1002-19(1989) which sets the requirements for the CCBWQA to address the nonpoint source problems:

> "1. Best management practices, to limit nonpoint source pollution, will be implemented by local governments, as outlined in the Cherry Creek portion of the 208 Water Quality Plan."

Soil loss from erosion due to construction activity can be as great as 156 tons per acre per year. This is considerably higher than the erosion rate of less than 1 ton per acre per year occurring on agricultural watersheds and in altered urbanized drainage basins. Soil tests in the Cherry Creek Basin showed the soil phosphorous content to vary from 1.0 ppm to an extreme of 60 ppm. Using the average of 7.96 ppm, the amount of phosphorous contained in the increased sediment generated annually by construction activity on one acre of land is 2.5 pounds. Given the likelihood of at least 200 acres of construction occurring anywhere in the basin at one time, the total phosphorous generated by construction activity would be at least 500 pounds. Using these calculations, the amount of phosphorous eroding from construction sites would exceed the phosphorous allocation of most of the point sources, a fact which illustrates the necessity for erosion control on construction sites.

The Authority has developed a model Best Management Practices Ordinance. This ordinance requires control during construction and revegetation of denuded areas. The ordinance, or variations thereof at least as stringent, have been adopted by one county and four cities. The Authority will encourage the remaining county to adopt the Best Management Practices Ordinance. The Authority has also established a disturbed lands fee which applies to all residential and commercial construction in the basin and to grading projects. The fee is $50.00/single family residence, $.03 per square foot of footprint for commercial and $280.00/acre for construction and grading not related to residential, commercial or industrial development. The Authority believes that the Best Management Practice has been very effective in reducing nonpoint source phosphorous loads.

Nonpoint Control Strategy

The following points were expressed in the 1985 Master Plan on suggested strategies for nonpoint control. The response to each point is expressed as follows:

1. Construction of control structures which effectively reduce phosphorous.

   The Master Plan concluded that detention followed by rapid infiltration (assumed 95 percent removal efficiency) and detention followed by filtration (assumed 50 percent removal efficiency) were all options which could be installed on a subbasin level and would effectively reduce the nonpoint phosphorous.

   The Authority, in conjunction with the City of Aurora, funded the Shop Creek subbasin project which was constructed in early 1989. Monitoring of that project will proceed to determine the effectiveness of future subbasin projects.

   The Authority will monitor the Shop Creek project to determine its effectiveness for phosphorous removal. It is anticipated that the wetlands vegetation will be established in approximately one year. Because control structures such as Shop Creek are very expensive to construct, it is recommended that additional large scale control structures not be constructed until the effectiveness of the Shop Creek controls have been fully evaluated. The effectiveness of Shop Creek will probably not be known until 1992.

2. Creation of an institution which is responsible for implementing and regulating the program.

   The governmental entities involved in the CCBA prepared legislation in the 1987 and 1988 Colorado Legislative Sessions. The 1988 Colorado General Assembly enacted House Bill 1029 which was signed by Governor Romer on April 28, 1988. A copy of the Act is included in Appendix.

   Basically, House Bill 1029 provides the legal framework for the Cherry Creek Basin Water Quality Authority (CCBWQA) and authorizes funding in the form of fees and a .5 mill general tax levy covering the entire basin in Arapahoe and Douglas Counties. A detailed description of the CCBWQA Act and operations is in Section VII.

3. Implementation of control structures in priority subbasins.

   Previous assessment of phosphorous production indicates that five subbasins (Shop Creek, Cottonwood Gulch, Happy Canyon, Direct Flow #4, Direct Flow #5) are contributing a significant portion of the annual load to the reservoir and it would be cost effective to install control structures on these basins. Controlling the nonpoint on these five subbasins as a priority

will help to remain below the 10,290 annual poundage limit and provide enough time for development of point source controls and to plan for future nonpoint control needs on other subbasins. Figure 2 shows the five priority subbasins.

The CCBWQA participated in the Shop Creek Project by funding $463,000 worth of water quality improvements within the overall drainage project. The CCBWQA will include the flows out of the Shop Creek facility in the monitoring program to test the effectiveness of the subbasin part of the overall Master Plan before proceeding on the remaining four subbasins.

Future Situation

Table 2

As the Cherry Creek Basin becomes more urbanized, the nonpoint phosphorous contribution will increase. The load and runoff volume in Table 11 are the direct result of the land use projections in conjunction with a year of average rainfall. If actual growth in the basin differs from the projection or a nonaverage rainfall year occurs, the loading rates and runoff volumes will change. If the future nonpoint loading is uncontrolled, it is projected that the reservoir phosphorous standard will be exceeded prior to 2000 (including base flow conditions). The nonpoint source contribution will have to be reduced such that the combined load from point sources, nonpoint sources and base flow conditions does not exceed the basinwide phosphorous limit. This goal will be accomplished by implementing a nonpoint control program.

The CCBWQA is aware of the Colorado Nonpoint Assessment Report and the 1987 amendments to Clean Water Act which require permits for nonpoint source discharges. Since the basin has been identified as having nonpoint source problems, controls may be required. The Authority will coordinate appropriately with federal, state and local agencies responsible for implementing the program.

Basinwide Nonpoint Control Program

In Chapter III. the annual basinwide phosphorous limit was identified, as well as the critical point source load. These two loading limits result in a balance of 10,290 pounds of phosphorous annually which are allocated to nonpoint sources. As long as the 10,290 nonpoint pounds were not exceeded, the reservoir was expected to be protected up to the year at which the critical load appears, assuming appropriate point source controls are in place. The objective of the nonpoint control program was to control or stay below this initial target of 10,290 annual nonpoint pounds by implementing effective nonpoint control measures.

Figure 2 identifies the Priority Nonpoint Control Subbasins in the Cherry Creek Basin.

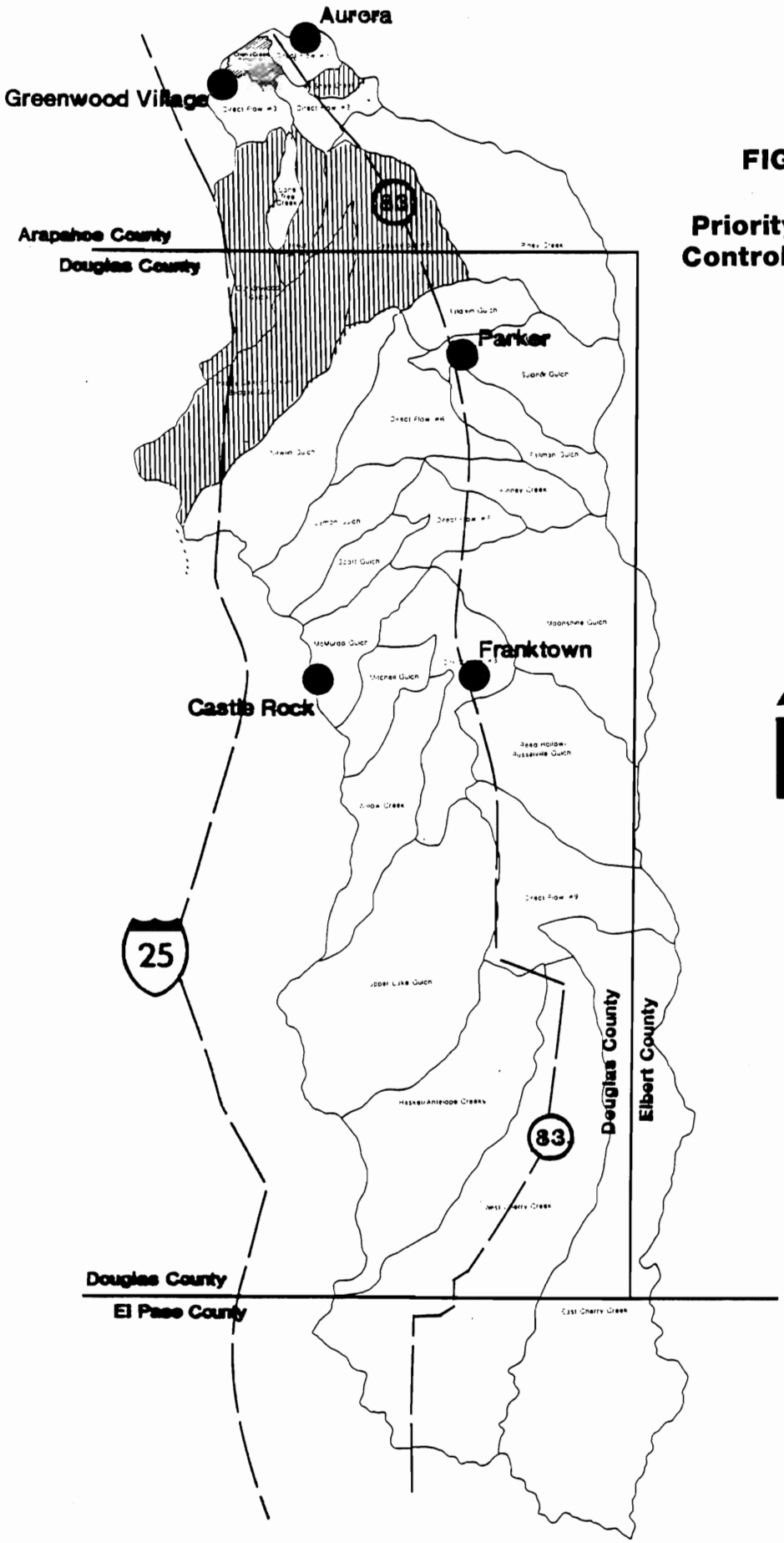

FIGURE 2

Priority Nonpoint Control Subbasins

Best Management Practices (BMPs)

Best Management Practices (BMPs) for nonpoint control are an important element of the phosphorous control program. The allowable annual phosphorous load and the nonpoint control program are based upon general purpose governments adopting erosion control ordinances for new development in order to prevent excessive phosphorous loading by erosion from construction sites. Essentially, no measure should be rejected as a viable control option if it removes phosphorous. However, it is prudent to concentrate on those BMPs which effectively remove phosphorous and are feasible for the Cherry Creek Basin.

The CCBWQA has established a model regulation which has been suggested for the regulatory land use entities in the basin. It is suggested in the next five year program to thoroughly investigate the application of the regulations in practice and suggest modifications where indicated.

VI. POINT SOURCE CONTROL

One of the significant elements of this Master Plan is to determine the location of wastewater treatment facilities and the type of treatment to be used by each facility. To arrive at a selected wastewater treatment system, 10 basin wastewater treatment scenarios with a variety of treatment methods were evaluated. This evaluation included treatment provided by joint-use facilities, individual facilities and a combination of individual and joint-use facilities. Types of treatment evaluated ranged from common treatment among all dischargers to a mixture of land application and direct discharge. Part of the evaluation was completed by an independent consultants. The recommended wastewater treatment option is a system of 12 treatment plants with individual service areas which would provide service to the entire urbanized portion of the basin. The rationale for selecting this option is as follows:

1. All scenarios were evaluated in terms of water quality impacts. The evaluation determined that the number of wastewater treatment plants in the basin did not improve or degrade the water quality in the reservoir. Rather, the type of wastewater treatment and effluent phosphorous concentration controlled the reservoir water quality.

2. The ability to reuse wastewater in the basin is vital for both water rights and water supply reasons. Water users whose water supply comes solely from deep bedrock aquifers must reuse their wastewater for irrigation because of the physical and legal constraints on the amount of water which can be pumped from the aquifers and to conserve the water in those aquifers. Water users whose water supply comes from Cherry Creek must return their wastewater to Cherry Creek at their point of effluent discharge to prevent injury to the water rights of other water users on the stream pursuant to the requirements of court decreed augmentation plans. Each scenario which includes joint use facilities required that treated wastewater be pumped back from the joint use facility to the individual water user to satisfy these requirements. Since there is no greater impact on water quality with 12 plants than with fewer plants, it is an unnecessary expense to pump treated effluent back to the place where the effluent was generated.

3. The 12 plant option ranked highest when compared to the other scenarios according to nonquantifiable criteria such as environmental impacts, land use impacts, implementation flexibility, reliability, reuse potential, and impact on existing facilities.

4. Although not the least expensive alternative, this scenario of 12 treatment plants was only marginally higher than the least expensive ($2,150/1,000 gal. of treated wastewater for the 12 plant option versus $2,120/1,000 gal. of treated wastewater for the 10 plant option including four joint-use facilities).

Septic System Policy

Septic systems provide another source of phosphorous which is presently unregulated with respect to phosphorous. If the basin must regulate point and nonpoint phosphorous, it follows that septic systems should also meet certain phosphorous performance standards. The CCBWQA, in cooperation with Tri-County Health Department, is working on septic system criteria for meeting phosphorous standards. With the large population projected to be using septic systems in the basin, it is logical to expect that a significant quantity of phosphorous could be generated from this source. By establishing septic system phosphorous performance standards, it may be possible to keep this source of phosphorous to a minimum.

The performance criteria could be based on allowing septic systems in soils which would initially remove more than 95 percent of the phosphorous. The criteria could be based on an on-site system design which evaluates soil type, percolation rates, loading rates and unsaturated soils depths in order to achieve an overall removal efficiency of approximately 80 percent after 20 years of use. Such a criterion would necessitate soil testing to determine which soils are conducive to the highest rate of phosphorous removal.

The CCBWQA has an existing contract with Tri-County Health for a septic tank study which, when complete, should:

1. Quantify existing loadings from septic systems.

2. Evaluate soil types in the septic tank development areas in the basin.

3. Evaluate any other factors such as system location to assist local land planning agencies in the development approval process.

Initial test sites have been established at two new septic tank installations. Various monitoring equipment has been installed and Tri-County Health officials made the following report to the CCBWQA in October of 1989:

> "The limited data available from Site 1 indicates that the septic system is achieving efficient phosphorous removal. The phosphorous concentration in septic tank effluent entering the leachfield has averaged approximately 7 mg/L. The total phosphorous concentration in the ground water mound migrating away from the system has varied from a high of 0.92 mg/L to a low of 0.02 mg/L. Overall total phosphorous reduction is approximately 95%. Substantial additional data will be needed over an extended period of time before conclusions can be drawn."[16]

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[16]Tri-County Health Department, Update of Cherry Creek Basin Water Quality Master Plan Correspondence, October, 1989.

Until such time as more information is known about septic tank effect on the reservoir, the initial allocation of 450 pounds of phosphorous will be maintained.

Location of Wastewater Treatment Facilities and Method of Treatment

Figure 3 identifies the recommended facility service areas and the location of each treatment facility within the basin. The service areas cover the urbanized portion of the basin and represent what each local government or special district perceives as being the area in which it can provide service. The type of treatment and effluent concentration used by each discharger appears in Table 10.

The point source control program for these facilities is predicated on three principal assumptions:

1. The point source discharge permits and site applications assume that a nonpoint control program is operating in the Basin and effectively removing 50 percent of the annual nonpoint load.

2. No point source within the Cherry Creek Basin will discharge an effluent with a total phosphorous concentration greater than 0.5 mg/L as a daily maximum.

3. Phosphorous allocations for site approvals and permits issued to existing facilities within the Cherry Creek Basin will be based on total phosphorous effluent quality of 0.1 milligrams per liter (mg/L) or better at the design capacity of the treatment plant.

Phosphorous Allocation Process

The critical point source loading defines how much phosphorous can be allocated to the point sources in the basin. A point source allocation process, which will be reviewed and incorporated into an annual basinwide water quality assessment report, will be incorporated into discharge permits in order to maintain regulatory control over the process. Incorporating the allocation into discharge permits is the only means by which the State Department of Health can enforce the phosphorous control program and have the guarantee that a discharger is in compliance with the basinwide allocation program.

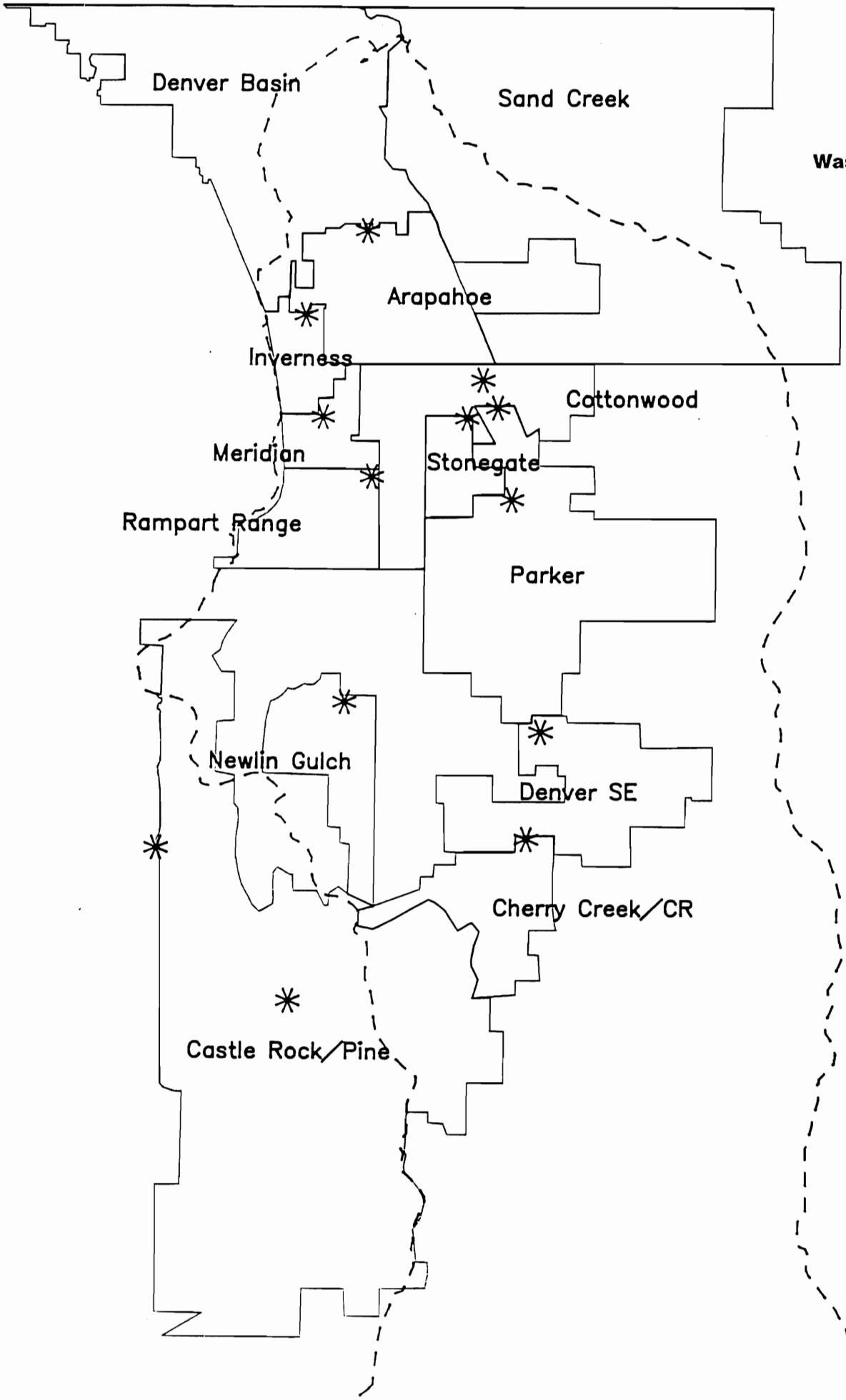

FIGURE 3

Location
Wastewater Treatment
Facilities

Table 10

Wastewater Treatment Facilities
and Method of Treatment

Discharger	Type of Treatment and Effluent Concentration[1]
Arapahoe	AWT, discharge, 0.1 mg/L phos. for 1/2 year, sec. treatment, land application, .05 mg/L for 1/2 year
Inverness	Sec. treatment, land application, 0.05 mg/L
Meridian	Sec. treatment, land application, 0.05 mg/L
Cottonwood	Sec. treatment, rapid infiltration, 0.05 mg/L
Stonegate	Sec treatment, land application, 0.05 mg/L
Parker	AWT, discharge, 0.1 mg/L for 1/2 year, sec. treatment, land application, 0.05 mg/l for 1/2 year
Denver Southeast	AWT, rapid infiltration, 0.05 mg/L
Castle Rock (Cherry Creek, McMurdo, Mitchell Creek, Newlin Gulch)	AWT, land application 0.05 mg/L
Rampart Range	AWT, discharge, 0.1 mg/L for 1/2 year, sec. treatment, land application, 0.05 mg/L for 1/2 year

[1]Effluent concentrations are those recognized for the specific type of treatment by the Colorado Department of Health, Water Quality Control Division.

The phosphorous control program was dependent upon allocation of phosphorous to the primary sources so that the 14,270 annual pounds are not exceeded. As a minimum, the phosphorous allocation process contains the following elements:

1. The CCBWQA is the institution responsible for recommending phosphorous allocations to point source facilities. The recommendations are forwarded to the Department of Health, Water Quality Control Division, for use in issuing discharge permits.

2. Point source phosphorous allocations have been established for each facility. The 1985 adopted allocations are those shown in Table 7.

3. The type of wastewater treatment and wastewater flows for each facility recommended are this plan. If the treatment technologies on wastewater flows change, then the annual phosphorous allocation for a facility will need to be recalculated.

4. All of the point source phosphorous allocations are recommended by the CCBWQA. The point sources are not entitled to a specified quantity of phosphorous but operate their treatment works in a manner which stays below their annual allocation.

Phosphorous Allocation by Facility

Based on these assumptions and applying a 12-plant system to the basin, individual phosphorous allocations by facility were determined. The critical point source load available for wastewater dischargers as identified in Chapter III is 2,310 pounds of phosphorous annually. The allocation of this annual load to the 12 facilities is based upon existing capacities plus the next planned expansion. It appropriates a substantial amount of the available point source phosphorous with a reserve for emergency situations. The allocations are shown in Table 11.

The phosphorous allocations set forth in Table 11 are not "owned" by the individual dischargers, but have been allocated as a part of the phosphorous control program. Table 12 sets forth projected phosphorous needs at build-out of each facility service area.

Table 11

Twelve-Plant Phosphorous Allocation

Discharger	Existing Discharge	Future Allowed Phosphorous Discharge (lbs/yr)
Arapahoe	122	354
Inverness	68	68
Meridian	114	114
Cottonwood	114	213
Stonegate	19	53
Parker	379	533
Denver Southeast	365	365*
Castle Rock		
Cherry Creek	0	21**
McMurdo	15	64**
Mitchell	15	128**
Newlin Gulch	0	86**
Rampart Range	0	160
Total	1,211	2,159

*The present facility at Denver Southeast Suburban Water and Sanitation District requires 365 pounds of phosphorous annually. The 365 pound phosphorous allocation to Denver Southeast is temporary and should be reduced to 213 pounds of phosphorous in 1990 or when Denver Southeast completes construction of its 1.4 mgd facility, whichever occurs first.

**The Castle Rock, Cherry Creek plant 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 in this Table and added to the Castle Rock, Cherry Creek facility. Effluent from the Mitchell and McMurdo service areas is being transported out of the Basin to the Castle Pines/Castle Rock facilities. The phosphorous discharge allocated to Castle Rock for the Mitchell and McMurdo plants may be transferred to any other Castle Rock facility and will include phosphorous for land application within the Mitchell and McMurdo subbasins.

Table 12

Projected Phosphorous Needs at Build-Out

Discharger	Phosphorous at Ultimate Build-Out
Arapahoe	2,435
Inverness	114
Meridian	304
Cottonwood	517
Parker	1,518
Stonegate	114
Denver Southeast	852
Castle Rock	
Cherry Creek	274
McMurdo	244
Mitchell	244
Newlin Gulch	551
Rampart Range	1,328
Total	8,495

The information in Table 12 indicates that only 26 percent of the phosphorous needed at build-out is recommended for allocation to facilities. Before the allocations in Table 11 are adjusted beyond the critical point source load, more nonpoint control in-reservoir controls or improved wastewater treatment technologies will have to be implemented to remove more phosphorous.

As noted earlier, the point source allocation program is based on a successful nonpoint control and reservoir programs. If nonpoint source control projects and/or in-reservoir controls demonstrate that more than 50 percent of the phosphorous is removed, phosphorous credits could be granted for additional point source or nonpoint source projects.

VII. IN-RESERVOIR SOLUTIONS

Wetlands Treatment

An important alternative suggested by the CDM/Riverside Report was consideration of a sediment trap/wetlands on the Cherry Creek Reservoir property upstream of the reservoir. The proposal is that the construction of a sediment trap on the main stem, just upstream of the reservoir, would be very effective in removing sediments at a central location. Cherry Creek flows would pass through the sediment trap and then into a wetlands area that would provide a final treatment for nutrients before the flow has reached the reservoir.

There are a number of questions associated with the proposal for a sediment trap and wetlands. These include whether it is feasible to construct a sediment trap in the alluvium at this location, and whether the smaller sediments that generally contain the phosphorous can be settled out and maintained within the sediment area during larger runoff events. In addition, there is a need to evaluate the effectiveness of wetlands at this location in removing phosphorous and need to experiment with ways of harvesting those wetlands to accomplish the ultimate nutrient removal.

Further work needs to be accomplished on a suggestion for channel stabilization to control erosion and to provide wetland low flow sections. Also, there needs to be further analysis of wetlands vegetation in the bottoms of the channels to help stabilize the channels and also offer treatment in the form of phosphorous removal the same as in a major wetland project.

In-Reservoir Solutions

Two in-reservoir solutions have been noted in the various studies completed by the CCBWQA to date. First, it appears prudent to analyze the use of alum to remove phosphorous from the water column during the time of major algae blooms. The treatment with alum is suspect because of the shallow depth of the reservoir and, hence, the potential for resuspending the alum flock and the phosphorous. Further study and pilot programs should be conducted to determine if, in fact, this is the case, since alum has been a successful means of treatment in other parts of the country.

The second in-reservoir option is certainly the most difficult one, but potentially the most effective one, and that is wet dredging. The Authority is considering moving ahead to gain permission from and cooperation of the Corps of Engineers to wet dredge a portion of the reservoir and to utilize other Corps property for the settling and removal of these sediments. There are problems associated with the dredging, including potential disturbances in the reservoir to recreational activity, the potential problems with the settling of very fine material, and potential problems with the disposal of the material from the site. These are all items that need further study and perhaps addressed through a pilot program.

The third significant point of the studies is that, out of a wide variety of techniques available for reducing plant and algae growth in reservoirs, only a few would be effective in Cherry Creek Reservoir, and even those identified may present potentially significant problems. In-reservoir control options eliminated either because they would be ineffective, overly costly or impractical, included algae harvesting, introduction of grass carp, artificial circulation/destratification, physical/chemical treatment, and reservoir flushing/hypolimnetic discharge. Other options that are not likely to be acceptable are bio-manipulation to promote zooplankton in the reservoir because of its impact on the fishery and algicide because of its potential toxicity. Options that could be effective in meeting one or more of the objectives of lake enhancement include the installation of bottom aeration in the deepest parts of the reservoir to prevent anoxic conditions during certain times of the year, phosphorous precipitation through the application of alum, sediment removal by dredging, and ozonation.

The development of large scale wetlands, in conjunction with a large scale sediment pond on the Cherry Creek Recreational Park grounds upstream of the reservoir, could potentially be as effective in removing sediments and nutrients as in-basin water quality ponds at less than 20% of the costs.

More information needs to be developed before any of these programs can be recommended confidently.

VIII. INSTITUTION

The 1985 Master Plan described in great detail the need for an institutional mechanism which would have the ability to address all of the aspects of phosphorous control in the basin. The following quote from the 1985 Master Plan summarizes the recommendation of the report:

> "A single institution is recommended to control the point sources, nonpoint program and the phosphorous allocation program. Creation of separate institutions responsible for the point source implementation, nonpoint source control and the allocation process would not address the dynamics of the phosphorous problem and would likely jeopardize the necessary coordination.
>
> To effectively address these issues the institution will need to have four basic functions: planning, construction, operation and financing.
>
> During the development of this Master Plan, consideration was given to using existing entities and, if necessary, to create a new institution. The authority of existing entities (counties, towns, special districts and private firms) was examined to determine if these entities could carry out the basic functions. While all of these individual institutions met the basic roles, no single entity could provide the necessary basinwide coordination.
>
> A new entity with all the necessary authority and rules could be created by the General Assembly, but formation by legislative action could take several years."

Further, the plan recommended that an intergovernmental agreement between the major entities appeared to be the most feasible approach.

> "Based on experience in Summit County, an intergovernmental agreement is viewed as a logical solution for forming the institution. The agreement would establish a Basinwide Authority which would be responsible for planning, operating, constructing and financing of nonpoint control facilities. It would also be responsible for recommending phosphorous allocations among the point source dischargers. With this type of

agreement, local governments in the basin would have control of the phosphorous control program. Members of the Basinwide Authority, as established by the intergovernmental agreement, are recommended to be:

Arapahoe County

Douglas County

Municipalities in the Cherry Creek Basin

Special Districts in the Cherry Creek Basin involved in the collection, operation and treatment of wastewater and wastewater treatment facilities

The needed institutional criteria are:

1. That it be based on local control;

2. That it encompass the developing portion of the basin with provisions to include undeveloped portions of the basin in the future;

3. That it have the ability to construct, finance, operate and maintain nonpoint source controls;

4. That it be able to collect fees and recommend mill levies which will be specifically used for phosphorous control structures; and

5. That it become the management agency for the basin."

Intergovernmental Agreement

The parties involved in the initial efforts following the Clean Lake Study and in the 1985 Master Plan, came together and executed the intergovernmental agreement creating the Cherry Creek Basin Authority on October 2, 1985.[17] The following is a list of the parties to the agreement:

1. Arapahoe County;
2. Douglas County;
3. The Town of Castle Rock;
4. The Town of Parker;
5. Greenwood Village;
6. The City of Aurora;
7. The Arapahoe Water and Sanitation District;
8. Cottonwood Water and Sanitation District;
9. Denver Southeast Suburban Water and Sanitation District;
10. Inverness Water and Sanitation District;
11. Meridian Metropolitan District;
12. Parker Water and Sanitation District; and
13. Stonegate Center Metropolitan District

The newly created CCBA proceeded to assess each member $15,000 a year to accomplish the described duties and responsibilities. Early emphasis was placed on activities which set priority for monitoring water quality, both in and flowing into the reservoir. Also, the members began work on a legislative program which was designed to create an institution with the authority to levy property taxes and collect various fees and charges. The intergovernmental Agreement was terminated by the parties on June 16, 1988.

Legislation

Draft legislation was presented to the 1987 General Assembly. Concerns of several agencies and individual legislators stalled the legislation in committee. At the request of the interim joint committee, revised legislation was developed in the summer of 1987. Individual board members and a lobbyist developed modified legislation for the 1988 General Assembly. After lengthy hearings and considerable negotiation with several agencies of state and local government, the Cherry Creek Basin Water Quality Authority Act (HB 1029) was enacted and signed by the Governor on April 28, 1988.

Immediately following the passage of HB 1029, the Cherry Creek Basin Authority rescinded the intergovernmental agreement and all assets, records and contracts for services were transferred to the Cherry Creek Basin Water Quality Authority (CCBWQA).[18]

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[17]Appendix A.

[18]Appendix B.

Financing

The CCBWQA has adopted fees, a mill levy and operates pursuant to an annual budget.

1. The fees adopted are:

   a. A .5 mill levy property tax on all properties in Arapahoe and Douglas Counties located in the Cherry Creek basin.

   b. Fees of 3 cents per square foot on commercial building permits and impermeable surfaces.

   c. Fees of 5 cents per 1,000 gallon discharge flows of sewage treatment facilities.

   d. A $3.00 per year fee on vehicles using the Cherry Creek Reservoir State Park.

   e. A building permit fee of $50.00 per residential dwelling.

   f. Assessed fees for grading permits of $280.00 per acre.

   Note: The CCBWQA negotiated with the State Parks Department, land use and utility jurisdictions for administration and collection of the fees and charges.

IX. IMPLEMENTATION

The CCBWQA has an on-going monitoring program which is described in the annual report to the Colorado Water Quality Control Commission. The data produced by the program will be used to suggest overall program modification at a point in the future when analysis of the data will support changes.

This Revised Basin Master Plan is an ambitious program to anticipate providing of wastewater service in a rapidly growing area while protecting the water quality of Cherry Creek Reservoir. Implementation of the plan will require clearly defined programs in the point source and nonpoint source areas. This chapter identifies and presents these programs plus the estimated revenues available for project costs.

Monitoring and Reports

This element of the Implementation Program is an ongoing responsibility of CCBWQA.

1. Administration of ongoing monitoring programs for both in-lake and stream water quality.

2. An annual report on activities and program progress with the Colorado Water Quality Control Commission.

3. Develop recommendations related to the control of phosphorous in wastewater discharge. This will be an evaluation of the amount of phosphorous delivered to the reservoir from present treatment plants in the Basin, and the total load delivered via the treatment plants versus other sources.

Programs and Studies

The program and studies element of the Plan presumes a five year effort starting in 1990 and extending through 1994. The best way to view this element of the Plan is to visualize the effort as a continuum of events, each dependent on the viability of preceding studies or pilot program within the category of effort. The following is a listing of the events by category within this element of the Plan:

1. Pilot Programs

   CCBWQA will apply to the Corps of Engineers for permits to dredge the reservoir in a pilot program, and to develop a sediment pond/wetland area on Corps' property upstream of the reservoir. The dredge plan will identify the area of pilot

dredging, the location of sediment ponds and the location of the storage area for the materials that are removed. To be effective, the sediment/wetland facility must be able to remove the sediments and harvest the wetland.

- Initiate a pilot wet dredging program.
- Continue dredging program and expand if successful.
- Construct a pilot wetlands/sediment pond project.
- Monitor wetland/sediment pond project for effectiveness.

The CCBWQA will conduct a pilot study to investigate the precipitation of phosphorous with alum in a limnocorral located in the reservoir and coincidentally complete a verification of limiting nutrients. The study will provide information on the effectiveness of an alum project.

- Analyze the alum treatment pilot program and determine whether to discontinue or enlarge the program depending on the first year evaluation.
- Expand alum treatment program.

2. Studies

Initiate a study to determine the effectiveness of the best management practices. The purpose of the study is to develop the most effective sediment removal processes as possible.

Evaluate all programs on the wetlands/sediment pond, wet dredging, alum treatment and structural subbasin improvements for effectiveness in overall program terms. Select the most effective mix of programs for dollars available.

3. Institutional

- The Authority will proceed to implement the elements of this plan for phosphorous control strategies in the basin.
- The Authority will develop criteria for participation in local projects to the extent of the water quality improvement costs.
- The Authority will monitor all new technology for transfer to the basin problems.
- The Authority will emphasize the coordination with all agencies and institutions involved in the various regulatory processes connected with the Cherry Creek Basin.

Financial Capacity

The planned programs, studies and projects have not been costed to any degree of reliability at this point. Rather than trying some sophisticated guesswork at costs, the approach of projecting financial capacity was deemed more rational. Therefore, the following five year revenue and investment program is presented to show the capacity which can be channeled to the effort.

The estimates used to drive the revenue and expense forecasts are based on a 2.5 percent per year average growth rate in the Basin.

Table 13

CHERRY CREEK BASIN WATER QUALITY AUTHORITY
Estimated Financial Capacity 1990–1994

	1989	1990	1991	1992	1993	1994	Totals
Revenues							
Beginning Fund Balance	61,657	237,157	50,000	50,000	50,000	50,000	498,814
Wastewater Surcharge	24,000	26,400	29,000	32,000	35,500	39,000	185,900
Building Permit Fee	25,000	27,500	30,250	33,250	36,500	40,000	192,500
Property Tax	370,000	388,500	406,000	428,400	450,000	472,500	2,515,400
Specific Ownership Tax	18,000	19,000	20,000	21,000	22,000	23,000	123,000
Recreation Fees	120,000	123,500	127,200	131,000	132,000	132,000	765,700
Interest Income	10,000	15,000	18,000	20,000	20,000	20,000	103,000
Total Revenues	628,657	837,057	680,450	715,650	746,000	776,500	4,384,314
Expenditures							
Administration:							
Accounting	4,800	6,000	7,000	8,000	8,000	8,000	41,800
Auditing Expense	3,000	4,000	4,000	4,000	4,000	4,000	23,000
Printing and Publications	14,000	15,000	15,000	15,000	15,000	15,000	89,000
Consulting Expense	30,000	20,000	25,000	25,000	25,000	25,000	150,000
Management	30,000	30,000	30,000	30,000	30,000	30,000	180,000
Management–Special Projects	10,000	10,000	15,000	15,000	15,000	15,000	80,000
Insurance	6,700	7,000	8,000	8,000	8,000	8,000	45,700
Legal – Regulatory	1,000	7,000	7,000	5,000	5,000	5,000	30,000
Legal – Regular	30,000	15,000	15,000	15,000	15,000	15,000	105,000
Legal–Special Projects	5,000	10,000	15,000	15,000	15,000	15,000	75,000
Miscellaneous	500	5,000	5,000	5,000	5,000	5,000	25,500
Contingency	2,000	40,000	40,000	40,000	40,000	40,000	202,000
Treasurer's Fee	6,500	7,000	8,000	9,000	10,000	11,000	51,500
Total Administration	143,500	176,000	194,000	194,000	195,000	196,000	1,098,500
Operations:							
Consultant–Technical Support	5,000	30,000	30,000	30,000	30,000	30,000	155,000
Septic Tank Study	20,000	0	0	0	0	0	20,000
Basin–wide Monitoring	60,000	60,000	65,000	65,000	65,000	65,000	380,000
Annual Report	5,000	5,000	5,000	5,000	5,000	5,000	30,000
Monitoring Equipment	8,000	2,500	10,000	2,500	2,500	2,500	28,000
Shop Creek	120,000	120,000	120,000	110,000	0	0	470,000
Public Information Program	30,000	25,000	25,000	20,000	20,000	20,000	140,000
Contingency – Capital Projects	0	368,557	181,450	239,150	378,500	408,000	1,575,657
Total Operations	248,000	611,057	436,450	471,650	501,000	530,500	2,798,657
Total Expenditures	391,500	787,057	630,450	665,650	696,000	726,500	3,897,157
Total Revenues Over Expenditures	237,157	50,000	50,000	50,000	50,000	50,000	487,157

APPENDIX A

AGREEMENT FOR CHERRY CREEK BASIN AUTHORITY

AGREEMENT FOR THE
CHERRY CREEK BASIN AUTHORITY

THIS AGREEMENT entered into as of this 2nd day of October, 1985 by and among the following:

1. Arapahoe County;

2. Douglas County;

3. The Town of Castle Rock;

4. The Town of Parker;

5. Greenwood Village;

6. The City of Aurora;

7. The Arapahoe Water and Sanitation District;

8. Cottonwood ~~Metropolitan District;~~ Water and Sanitation District; Jes

9. Denver Southeast Suburban Water and Sanitation District;

10. Inverness Water and Sanitation District;

11. Meridian Metropolitan District;

12. Parker Water and Sanitation District; and

13. Stonegate Center Metropolitan District.

WHEREAS, the parties to this Agreement have the authority pursuant to Article XIV, Section 18 of the Colorado Constitution and Section 29-1-201, et seq., Colorado Revised Statutes, to enter into intergovernmental agreements for the purpose of providing any service or performing any function which they can perform individually;

WHEREAS, the parties deem it necessary and advisable to enter into this Agreement in order to set forth their goals and objectives in implementing the Cherry Creek Basin Water Quality Management Master Plan (hereinafter referred to as the Plan) heretofore adopted by the Water Quality Control Commission of the State of Colorado;

WHEREAS, the parties, by their execution and adoption of this Agreement, wish clearly to memorialize their acceptance of the basic goals and objectives of said plan, which goals and objectives are promulgated for the general health and safety of all persons living, and utilizing water and property, within the Cherry Creek Basin, while recognizing the inherent governmental limitations incumbent upon each such party;

WHEREAS, the parties wish to establish herein an agenda for the implementation of the goals and objectives of the plan by the creation of alternative mechanisms by which the separate governmental entities signatory hereto may lawfully and prudently plan and budget monies for the funding of structures and programs for the control of phosphorus discharge into the Cherry Creek Basin;

NOW, THEREFORE, the parties hereby mutually agree as follows:

1. Cherry Creek Basin Authority. There is hereby established a Cherry Creek Basin Authority consisting of one voting member from each entity signatory hereto.

2. Voting. There is hereby created three categories of votes, representing the three types of governmental entities signatory hereto. In order for future phosphorus allocations, site plan approvals for site plans filed after the effective date of this agreement, discharge permits, plan amendments and budget and funding decisions to be approved, modified, or adopted, the same shall require that the following combinations be attained: (1) at least one affirmative vote from those counties signatory hereto, (2) at least one-half of those cities and towns signatory hereto, and (3) at least one-half of the special districts signatory hereto. All other decisions shall be made and decided by majority vote of all entities present and voting.

3. Purpose of Agreement. The parties hereby agree that, in order to provide for a coordinated approach to the protection of the water Quality of the Cherry Creek Basin, the following purposes must be accomplished:

a. Parties signatory hereto must commit funds for completion of initial engineering and planning, which funds are pledged pursuant to paragraph 6 hereof;

b. The parties must establish, by agreement, a prioritized listing of actions to be accomplished;

c. The parties, by agreement, must establish a time table for the accomplishment for those actions specified in the preceding subparagraph;

d. The parties, by agreement, must establish a date certain for the commencement and completion of necessary engineering studies.

The overall goals to be accomplished by the parties in completion of the above tasks include, but are not limited to, the following:

1. Provide for a regional, coordinated approach to phosphorus control in the Cherry Creek Basin;

2. Provide for a regional, coordinated approach for the construction and operation and maintenance of nonpoint phosphorus control projects;

3. Provide for regional, coordinated water quality monitoring of Cherry Creek Reservoir, Cherry Creek and the waters flowing into them, as well as recommending water quality standards for the reservoir and its tributary waters, as appropriate;

4. Provide for coordination with state and federal agencies having water quality responsibilities in the Cherry Creek Basin;

5. Make recommendations to the Regional Planning Agency and Water Quality Control Division, as appropriate, on phosphorus allocations to all sources and special allocations from the reserve pooling;

6. Provide for benefits to the parties to this Agreement, including but not limited to continuing local control over the herein described water quality programs and a continued or increased level of phosphorus load allocations; both of which will result in significant cost savings and the ability to provide for continued population growth in the respective jurisdictions of each of the parties hereto.

4. Officers; Bylaws. The Authority has the authority to elect such officers and adopt such bylaws and internal regulations as are necessary and convenient to carry out the purposes of this Agreement.

5. Duties and Responsibilities. The Authority shall have the following duties and responsibilities:

a. To seek legislative action from the Colorado Legislature to provide for any of the following;

1. Any necessary amendments to existing state statutes to grant specific bonding and taxing authority to counties, municipalities, and special districts to utilize in the operation of a basin wide authority, or

2. The creation of a specific basin wide authority with taxing and/or bonding powers, such as the specific authorities found in C.R.S. 1973, 29-1-204, 29-1-204.2, and 29-1-204.5.

b. The Authority, subject to funding limitations, shall have the following duties and responsibilities:

1. Develop and implement plans for water quality control strategies for the Cherry Creek Basin watershed and revise those plans as needed.

2. To the extent funds are, or may be made, available, construct, operate and maintain nonpoint phosphorus control projects;

3. Review nonpoint source control projects constructed in Cherry Creek Basin and recommend operation and maintenance plans, monitoring systems and phosphorus credits;

4. Recommend to the Regional Planning Agency and Water Quality Control Commission amendments to the water quality plan and wasteload allocations for the phosphorus sources in the Cherry Creek Basin;

5. Recommend to the Water Quality Control Division temporary allocations of phosphorus from the reserve pool to any entity which due to an emergency, upset or bypass condition is unable to meet their phosphorus allocation;

6. Oversee and conduct water quality monitoring in the Cherry Creek Basin and review, analyze and report on the water quality monitoring results to the Regional Planning Agency and Water Quality Control Commission;

7. Recommend to the local governments erosion and urban runoff control standards, which may be adopted by those local governments, for the Cherry Creek Basin;

8. Recommend programs to decrease the phosphorus contributions from septic systems, industrial sources, construction, or any other activities in the Cherry Creek Basin;

9. Conduct pilot studies on nonpoint source control projects, including monitoring of the effectiveness of certain projects and erosion control measures;

10. Prepare reports, including reports on the water quality of Cherry Creek Reservoir; audits on the construction projects, annual operations, maintenance and administrative summaries; audits upon the completion of each major construction project; and any other reports requested by the Authority;

11. Enter into lawful Agreements with any person, private corporation or business, or any federal, state or local government agency for the purposes contemplated by this Agreement;

12. Recommend nonpoint phosphorus control projects for construction and recommend funding mechanisms for constructions, operation and maintenance for nonpoint source projects within the Cherry Creek Basin;

13. Pursue continued study of potential phosphorus control solutions;

14. Analyze the cost effectiveness of recommended standards, regulations, ordinances and control projects;

15. Adopt annual scopes of work, budgets and fee assessments (pursuant to the limits of Section 6 herein) to carry out its responsibilities;

16. Hire staff as needed and/or contract with a public agency as an administrative agency to provide accounting, administrative, secretarial, audit, payroll and other staff functions;

17. Draft and continuously update a five-year projection of phosphorus loading levels and phosphorus discharge requirements for the Cherry Creek Basin;

18. Do any and all acts and things necessary to effectively exercise the powers given in this Agreement.

6. Funding. Each party signatory hereto agrees to provide $15,000 from its 1986 budget to fund ongoing monitoring and the activities specified in paragraph 3a through 3d above. To the extent funds are, or, in the exercise of sound legislative discretion may be made, available for subsequent fiscal years, the parties agree to budget a similar, or other agreed upon, sum in subsequent years to accomplish the purposes of this Agreement including the costs of planning, construction, operation and maintenance of improvements. The parties hereto pledge their best efforts, exercised in good faith, to provide funds for implementation of this Agreement until the legislative solutions to be sought pursuant to paragraph 5a hereof are attained.

In the event a governmental entity, in the exercise of its legislative discretion, is unable, due to budgetary considerations, to provide the funds specified herein in any fiscal year subsequent to 1986, the entity shall be provided an

opportunity until the 31st of January of the subsequent year to pay its proportionate share of funds due for the previous and the then-current year as called for herein from subsequent budgets or such other funds as the entity shall deem appropriate and lawful.

7. Enforcement. It shall be the responsibility of each party to this Agreement, having jurisdiction within the watershed covered by the plan, to consider the implementation of the water quality management plan agreed upon by the Cherry Creek Basin Authority. Members should use their best efforts to consider for adoption those erosion controls regulation that are recommended by the Authority as part of the water qualify control strategy. Adoption and enforcement of any such regulations shall remain within the sole jurisdiction and be the complete responsibility of each individual member.

8. Termination and Withdrawals.

a. Discharge permits issued and their phosphorus wasteload allocations are available because of the nonpoint source control plan to remove 50% of the nonpoint source phosphorus basinwide, to a level of 10,270 pounds of phosphorus per year. In the event that a member of the Authority ceases to participate or withdraws from participation in the Authority and its projects: (1) the withdrawing member shall have one hundred twenty (120) days, following written notice, in which to cure their withdrawal. If the withdrawal is not cured, the party shall lose all rights and benefits under this Agreement, which rights and benefits may be reassigned by action of the Authority.

b. Subject to the provisions of paragraph 6 hereof, should any member of the Authority fail to appropriate funds to satisfy its annual fee assessment, the rights and benefits accorded to such member by this Agreement may be terminated and may be reassigned by the Authority.

9. Addition of New members. New members, who are counties, municipalities, or special districts providing wastewater treatment services in the Cherry Creek basin, shall be admitted after approving and signing this agreement; agreeing to comply with the conditions, restrictions and limitations outlined in the bylaws of the Authority; and reimbursing the Authority for expenses incurred by the Authority for water quality monitoring and planning for the basin, and complying with conditions in the bylaws for new members.

10. Term of Agreement. This Agreement shall endure for a period of five (5) years from July 1, 1985. After this time, the Agreement shall be deemed to automatically renew each year; unless two-thirds of the members of the Committee vote to cancel the Agreement.

11. Amendment. This Agreement may be amended only by the unanimous vote of the entire Cherry Creek Basin Authority membership.

12. Execution. This Agreement shall be executed by the appropriate elected officials of each member.

DOUGLAS COUNTY, COLORADO

Attest:
By: _____ By: _____

ARAPAHOE COUNTY, COLORADO

Attest:
By: _____ By: _____

The Town of Castle Rock,
a Colorado municipal corporation

Attest:
By: _____ By: _____

The City of Greenwood Village,
a Colorado municipal corporation

Attest:
By: _____ By: _____

The City of Aurora,
a Colorado municipal corporation

Attest:
By: _____ By: _____

The Town of Parker,
a Colorado municipal corporation

Attest:
By: _____ By: _____
Town Clerk MAYOR

The Arapahoe Water and Sanitation District, a quasi-municipal corporation

Attest:

By: _____ Asst Sec

By: _____

Cottonwood ~~Metropolitan District~~ Water and Sanitation District, a quasi-municipal corporation

Attest:

By: _____ Secretary

By: _____

Denver Southeast Suburban Water and Sanitation District, a quasi-municipal corporation

Attest:

By: _____

By: _____

Meridian Metropolitan District, a quasi-municipal corporation

Attest:

By: _____ Secretary

By: _____

Inverness Water and Sanitation District, a quasi-municipal corporation

Attest:

By: _____

By: _____

Parker Water and Sanitation District, a quasi-municipal corporation

Attest:

By: _____

By: _____

Stonegate Center Metropolitan
District, a quasi-municipal

Attest:

By: _____

By: _____
PRESIDENT

APPENDIX B

HOUSE BILL 1029

1988

An Act

HOUSE BILL NO. 1029.

BY REPRESENTATIVES D. Williams, Ruddick, Carpenter, Chlouber, P. Hernandez, Masson, and Neale;
also SENATOR Fenlon.

CONCERNING THE CREATION OF THE CHERRY CREEK BASIN WATER QUALITY AUTHORITY.

Be it enacted by the General Assembly of the State of Colorado:

SECTION 1. Title 25, Colorado Revised Statutes, 1982 Repl. Vol., as amended, is amended BY THE ADDITION OF A NEW ARTICLE to read:

ARTICLE 8.5
Cherry Creek Basin Water Quality Authority

25-8.5-101. Legislative declaration. (1) The general assembly hereby finds and declares that the organization of a Cherry Creek basin water quality authority will:

(a) Be for the public benefit and advantage of the people of the state of Colorado;

(b) Benefit the inhabitants and landowners within the authority by preserving water quality in Cherry Creek and Cherry Creek reservoir;

(c) Benefit the people of the state of Colorado by preserving waters for recreation, fisheries, water supplies, and other beneficial uses;

(d) Promote the health, safety, and welfare of the people of the state of Colorado.

(2) It is further declared that the authority will provide for effective efforts by the various counties,

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Capital letters indicate new material added to existing statutes; dashes through words indicate deletions from existing statutes and such material not part of act.

municipalities, special districts, and landowners within the boundaries of the authority in the protection of water quality.

(3) It is further declared that the authority should provide that new developments and construction activities pay their equitable proportion of costs for water quality preservation and facilities.

(4) This article, being necessary to secure the public health, safety, convenience, and welfare, shall be liberally construed to effect its purposes.

25-8.5-102. Definitions. As used in this article, unless the context otherwise requires:

(1) "Agricultural lands" means all lands except land rezoned by a county or municipality for business, commercial, residential, or similar uses or subdivided lands. Those include property consisting of a lot with one acre or more in size which contains a dwelling unit.

(2) "Authority" means the Cherry Creek basin water quality authority created pursuant to section 25-8.5-103.

(3) "Board" means the governing body of the authority provided for in section 25-8.5-106.

(4) "County" means any county enumerated in article 5 of title 30, C.R.S.

(5) "Municipality" means a municipality as defined in section 31-1-101 (6), C.R.S.

(6) "Publication" means three consecutive weekly advertisements in a newspaper or newspapers of general circulation within the boundaries of the authority. It shall not be necessary that an advertisement be made on the same day of the week in each of the three weeks, but not less than twelve days, excluding the day of first publication, shall intervene between the first publication and the last publication. Publication shall be complete on the date of the last publication.

(7) "Resolution" means an ordinance as passed by a member municipality or a resolution as passed by a member county or special district.

(8) "Soil conservation district" means any soil conservation district created pursuant to article 70 of title 35, C.R.S.

(9) "Special district" means any district created pursuant to article 1 of title 32, C.R.S., which has the power to provide sanitation services or water and sanitation services and has wastewater treatment facilities within the boundaries of the authority.

(10) "Wastewater treatment facility" means a facility providing wastewater treatment services which has a designed capacity to receive sewage for treating, neutralizing, stabilizing, and reducing pollutants contained therein prior to the disposal or discharge of the treated sewage. "Wastewater treatment facility" does not include any pretreatment facilities, lift stations, interceptor lines, or other transmission facilities to transmit sewage effluent outside the boundaries of the authority.

25-8.5-103. Creation and organization. The Cherry Creek basin water quality authority is hereby created. The authority shall be a quasi-municipal corporation and political subdivision of the state, with the powers provided in this article.

25-8.5-104. Boundaries of the authority. (1) The boundaries of the authority shall be determined by the authority, subject to the following:

(a) The boundaries shall be limited to the drainage basin of Cherry Creek from its headwaters to the dam at Cherry Creek reservoir, which the general assembly hereby finds to be:

(I) Arapahoe county: Portions of sections thirty-five and thirty-six, township four south, range sixty-seven west of the sixth principal meridian; a portion of section thirty-one, township four south, range sixty-six west of the sixth principal meridian; portions of sections one, two, three, ten, fifteen, twenty-two, twenty-three, twenty-seven, and thirty-four, and all of sections eleven, twelve, thirteen, fourteen, twenty-four, twenty-five, twenty-six, thirty-five and thirty-six, township five south, range sixty-seven west of the sixth principal meridian; all of sections seven, seventeen, eighteen, nineteen, twenty, twenty-one, twenty-two, twenty-five, twenty-six, twenty-seven, twenty-eight, twenty-nine, thirty, thirty-one, thirty-two, thirty-three, thirty-four, thirty-five, thirty-six and portions of sections five, six, eight, nine, fourteen, fifteen, sixteen, twenty-three and twenty-four, township five south, range sixty-six west of the sixth principal meridian; all of section thirty-one and portions of sections nineteen, twenty-nine, thirty, and thirty-two, township five south, range sixty-five west of the sixth principal meridian;

(II) Douglas county: Portions of sections four, nine, sixteen, twenty-one, twenty-eight and thirty-three, and all of sections five, six, seven, eight, seventeen, eighteen, nineteen, twenty, twenty-nine, thirty, thirty-one, and thirty-two, township six south, range sixty-five west of the sixth principal meridian; township six south, range sixty-six west of the sixth principal meridian; portions of sections three, ten, fifteen, twenty-one, twenty-two, twenty-eight, thirty-one, thirty-two and thirty-three, and all of sections one, two, eleven, twelve, thirteen, fourteen, twenty-three, twenty-four, twenty-five, twenty-six, twenty-seven, thirty-four, thirty-five and thirty-six, township six south, range sixty-seven west of the sixth principal meridian; portions of sections four, nine, sixteen, and twenty-one, and all of sections five, six, seven, eight, seventeen, eighteen, nineteen, twenty, twenty-eight, twenty-nine, thirty, thirty-one, thirty-two, and thirty-three, township seven south, range sixty-five west of the sixth principal meridian; township seven south, range sixty-six west of the sixth principal meridian; portions of sections four, five, nine, fourteen, fifteen, sixteen, twenty-three, twenty-five, twenty-six, and thirty-six, and all of sections one, two, three, ten, eleven, twelve, thirteen, and twenty-four, township seven south, range sixty-seven west of the sixth principal meridian; portions of sections twenty-eight and thirty-three and all of sections four, five, six, seven, eight, nine, sixteen, seventeen, eighteen, nineteen, twenty, twenty-one, twenty-nine, thirty, thirty-one, and thirty-two, township eight south, range sixty-five west of the sixth principal meridian; portions of sections six, seven, eighteen, nineteen, twenty-nine, thirty, and thirty-one, and all of sections one, two, three, four, five, eight, nine, ten, eleven, twelve, thirteen, fourteen, fifteen, sixteen, seventeen, twenty, twenty-one, twenty-two, twenty-three, twenty-four, twenty-five, twenty-six, twenty-seven, twenty-eight, thirty-two, thirty-three, thirty-four, thirty-five and thirty-six, township eight south, range sixty-six west of the sixth principal meridian; a portion of section one, township eight south, range sixty-seven west of the sixth principal meridian; all of sections four, five, six, seven, eight, nine, sixteen, seventeen, eighteen, nineteen, twenty, twenty-one, twenty-eight, twenty-nine, thirty, thirty-one, thirty-two and thirty-three, township nine south, range sixty-five west of the sixth principal meridian; all of township nine south, range sixty-six west excepting portions of sections six and seven; portions of sections thirteen, twenty-three, twenty-four, twenty-five, and thirty-six, township nine south, range sixty-seven west of the sixth principal meridian; portions of sections twenty-eight and thirty-three, and all of sections four, five, six, seven, eight, nine, sixteen, seventeen, eighteen, nineteen, twenty, twenty-one, twenty-nine, thirty, thirty-one, and thirty-two,

township ten south, range sixty-five west of the sixth principal meridian; portions of sections five, six, seven, eight, seventeen, eighteen, nineteen, twenty-nine, thirty, thirty-one, and all of sections one, two, three, four, nine, ten, eleven, twelve, thirteen, fourteen, fifteen, sixteen, twenty, twenty-one, twenty-two, twenty-three, twenty-four, twenty-five, twenty-six, twenty-seven, twenty-eight, thirty-two, thirty-three, thirty-four, thirty-five and thirty-six, township ten south, range sixty-six west of the sixth principal meridian; a portion of section one, township ten south range sixty-seven west of the sixth principal meridian;

(b) Lands may be included within the boundaries of the authority pursuant to section 25-8.5-119.

(c) Lands within the boundaries identified in paragraph (a) of this subsection (1) may be excluded from the authority pursuant to section 25-8.5-120.

(2) The authority shall maintain a current map, showing all lands that are included in the authority's boundaries.

25-8.5-105. Authority members. (1) The following governmental entities shall be members of the authority:

(a) Every county which has property within the authority's boundaries;

(b) Every municipality which has property within the authority's boundaries; and

(c) Every special district which includes in its service area property within the Cherry Creek basin and which owns and operates a wastewater treatment services facility in the Cherry Creek basin. For the purposes of this paragraph (c), wastewater treatment services shall mean a wastewater treatment facility with a designed capacity to receive more than two thousand gallons of sewage per day.

25-8.5-106. Board of directors. (1) The governing body of the authority shall be a board of directors which shall exercise and perform all powers, rights, privileges, and duties invested or imposed by this article.

(2) Each authority member shall appoint one representative and two alternates to serve on the board. Any county, municipality, or special district that provides wastewater treatment services by contract with another entity which is a member of the authority shall not be entitled to a separate member on the board.

(3) Directors shall be appointed for terms of two years. Notice of each appointment shall be given to the recording secretary for the authority.

(4) No director shall receive compensation as an employee of the authority. Reimbursement of actual expenses for directors shall not be considered compensation.

(5) An appointment to fill a vacancy on the board shall be made by the authority member for the remainder of the unexpired term.

(6) If a board member or designated alternate fails to attend two consecutive regular meetings of the board, the authority may submit a written request to the appointing authority member to have its representative attend the next regular meeting. If, following such request, said representative fails to attend the next regular board meeting, the board may appoint an interim representative from the authority member's jurisdiction to serve until the authority member appoints a new representative.

(7) An authority member, at its discretion, may remove from office any board member or designated alternate representing the authority member and appoint a successor.

(8) The board shall elect one of its members as chairman of the authority and one of its members as secretary-treasurer and shall appoint a recording secretary who may be a member of the board.

(9) The recording secretary shall keep, in a well-bound book, a record of all of the authority's meetings, resolutions, certificates, contracts, bonds given by employees or contractors, and all corporate acts which shall be open to inspection of all interested parties.

(10) The secretary-treasurer shall keep strict and accurate accounts of all money received by and disbursed for and on behalf of the authority.

25-8.5-107. Voting. (1) Each authority member, through its designated director or designated alternate acting in the director's place, shall be entitled to one vote.

(2) Board action upon waste load allocations, site location, or site plans selected pursuant to section 25-8-702, discharge permits secured pursuant to section 25-8-501, amendments to the authority's wastewater management plan, and all budget and funding decisions shall require a vote of the following combinations of member votes:

(a) An affirmative vote of fifty percent of the counties which are members of the authority; and

(b) An affirmative vote of a majority of the municipalities which are members of the authority; and

(c) An affirmative vote of a majority of the special districts which are members of the authority.

(3) All decisions of the board not enumerated in subsection (2) of this section shall be made and decided by a majority of the quorum.

(4) A director shall disqualify himself from voting on any issue in which he has a conflict of interest unless such director has disclosed such conflict of interest in compliance with section 18-8-308, C.R.S., in which case such disclosure shall cure the conflict. A director shall abstain from voting if the director would obtain a personal financial gain from the contract or services being voted upon by the authority.

25-8.5-108. Ex officio members. (1) Ex officio members shall be provided with notice of the authority meetings. Ex officio members shall not serve on the board. Ex officio members are not voting members. The following shall be considered ex officio members:

(a) Every soil conservation district of which more than two-thirds of its territory is included within the authority's boundaries;

(b) Any other governmental or quasi-governmental agency designated as an ex offico member by the authority.

25-8.5-109. Meetings. (1) The board shall fix the time and place at which its regular meetings shall be held and provide for the calling and holding of special meetings.

(2) Notice of the time and place designated for all regular meetings shall be posted at the office of the county clerk and recorder of each of the counties included within the authority. Such notices shall remain posted and shall be changed in the event that the time or place of such regular meetings is changed.

(3) Special meetings of the board shall be held at the call of the chairman or upon request of two board members. The authority shall inform all board members five calendar days before the special meeting and shall post notice in accordance with subsection (2) of this section at least three days before the special meeting of the date, time, and place of such special meeting and the purpose for which it is

called.

(4) All business of the board shall be conducted only during said regular or special meetings, and all said meetings shall be open to the public, but the board may hold executive sessions as provided in article 9 of title 29, C.R.S.

25-8.5-110. Powers of board - organization - administration. (1) The board has the following powers relating to carrying on the affairs of the authority:

(a) To organize, adopt bylaws and rules of procedure, and select a chairman and chairman pro tempore;

(b) To make and pass resolutions and orders which are necessary for the governance and management of the affairs of the authority, for the execution of the powers vested in the authority, and for carrying out the provisions of this article;

(c) To fix the location of the principal place of business of the authority and the location of all offices maintained under this article;

(d) To prescribe by resolution a system of business administration, to create any and all necessary offices, to establish the powers and duties and compensation of all employees, and to require and fix the amount of all official bonds necessary for the protection of the funds and property of the authority;

(e) To appoint and retain employees, agents, and consultants to make recommendations, coordinate authority activities, conduct routine business of the authority, and act on behalf of the authority under such conditions and restrictions as shall be fixed by the board;

(f) To prescribe a method of auditing and allowing or rejecting claims and demands and a method for the letting of contracts on a fair and competitive basis for the construction of works, structures, or equipment or for the performance or furnishing of such labor, materials, or supplies as may be required for the carrying out of any of the purposes of this article.

25-8.5-111. Powers of authority - general and financial. (1) In order to accomplish its purposes, the authority has the power to:

(a) Develop and implement, with such revisions as become necessary in light of changing conditions, plans for water quality controls for the reservoir, applicable drainage basin,

waters, and watershed;

(b) Conduct pilot studies and other studies that may be appropriate for the development of potential water quality control solutions;

(c) Develop and implement programs to provide credits, incentives, and rewards within the Cherry Creek basin plan for water quality control projects;

(d) Recommend the maximum loads of pollutants allowable to maintain the water quality standards and allocate, if delegated the power to pursuant to federal or state law, waste loads among both present and future sources of pollutants;

(e) Recommend erosion controls and urban runoff control standards;

(f) Recommend septic system maintenance programs;

(g) Incur debts, liabilities, and obligations;

(h) Have perpetual existence;

(i) Have and use a corporate seal;

(j) Sue and be a party to suits, actions, and proceedings;

(k) Enter into contracts and agreements affecting the affairs of the authority including, but not limited to, contracts with the United States and the state of Colorado and any of their agencies or instrumentalities, political subdivisions of the state of Colorado, corporations, and individuals;

(l) Acquire, hold, lease (as lessor or lessee), and otherwise dispose of and encumber real and personal property;

(m) Acquire, lease, rent, manage, operate, construct, and maintain water quality control facilities or improvements for drainage, nonpoint sources, or runoff within or without the authority;

(n) Establish rates, tolls, fees, charges, and penalties except on agricultural land for the functions, services, facilities, and programs of the authority; except that the total annual budgeted rates, tolls, fees, and charges for property owners shall not exceed thirty percent of the annual authority budget and shall not exceed the total annual budgeted fees to be paid by users of the Cherry Creek reservoir;

(o) Establish in cooperation with the department of natural resources fees for Cherry Creek reservoir users, which amounts shall be subject to the review and approval of the board of parks and outdoor recreation, which shall not unreasonably withhold approval. Said reservoir fees, including all users regardless of activity, however established, shall not in total exceed the amount that would be collected if the reservoir user fee was one dollar per reservoir user per year.

(p) (I) Levy and collect ad valorem taxes on and against all taxable property within the authority subject to the limitation that no mill levy for any fiscal year shall exceed one-half mill, however, ad valorem taxes greater than one-half mill can be levied by the authority if it is approved by the electors at an election held according to the procedures of part 8 of article 1 of title 32, C.R.S.

(II) No property tax shall be levied until the fees from the recreation users and the development fees are established.

(q) Issue and refund revenue and assessment bonds and pledge the revenues of the authority or assessments therefor to the payment thereof in the manner provided in part 4 of article 35 of title 31, C.R.S., and as provided in this article;

(r) Invest any moneys of the authority in any manner permitted by law;

(s) Review and approve water quality control projects of any entity other than the authority within the boundaries of the authority;

(t) Except that the authority shall not have the power to regulate agricultural nonpoint source activities; such agricultural nonpoint source activities shall be subject only to the provisions of section 25-8-205 (5);

(u) Have and exercise all rights and powers necessary or incidental to or implied from the specific powers granted to the authority by this article. Such specific powers shall not be considered as a limitation upon any power necessary or appropriate to carry out the purposes and intent of this article.

25-8.5-112. Power to issue bonds. To carry out the purposes of this article, the board is authorized to issue revenue or assessment bonds of the authority. Bonds shall bear interest at a rate such that the net effective interest rate of the issue of bonds does not exceed the maximum interest rate set forth in the resolution adopted by the board

authorizing the issuance of the bonds, payable semiannually, and shall be due and payable serially, either annually or semiannually, commencing not later than three years after date of issuance. The form and terms of said bonds, including provisions for their payment and redemption, shall be determined by the board. If the board so determines, such bonds may be redeemable prior to maturity upon payment of a premium not exceeding three percent of the principal thereof. Said bonds shall be executed in the name and on behalf of the authority, signed by the chairman of the board with the seal of the authority affixed thereto, and attested by the secretary of the board. Said bonds shall be in such denominations as the board shall determine, and the bonds and coupons shall bear the original or facsimile signature of the chairman of the board.

25-8.5-113. Revenue refunding bonds. Any revenue bonds issued by the authority may be refunded by the authority, or by any successor thereof, in the name of the authority, subject to the provisions concerning their payment and to any other contractual limitations in the proceedings authorizing their issuance or otherwise appertaining thereto, by the issuance of bonds to refund, pay, and discharge all or any part of such outstanding bonds, including any interest on the bonds in arrears or about to become due, for the purpose of avoiding or terminating any default in the payment of the interest on and principal of the bonds, of reducing interest costs or effecting other economies, or of modifying or eliminating restrictive contractual limitations appertaining to the issuance of additional bonds or to any system appertaining thereto or for any combination of such purposes. Refunding bonds may be delivered in exchange for the outstanding bonds refunded or may be sold as provided in this article for an original issue of bonds.

25-8.5-114. Use of proceeds of revenue refunding bonds. The proceeds of revenue refunding bonds shall either be immediately applied to the retirement of the bonds being refunded or be placed in escrow in any state or national bank within the state which is a member of the federal deposit insurance corporation to be applied to the payment of the bonds being refunded upon their presentation therefor; but, to the extent any incidental expenses have been capitalized, such refunding bond proceeds may be used to defray such expenses, and any accrued interest and any premium appertaining to a sale of refunding bonds may be applied to the payment of the interest thereon or the principal thereof, or both interest and principal, or may be deposited in a reserve therefor, as the board may determine. Any such escrow shall not necessarily be limited to proceeds of refunding bonds but may include other moneys available for its purpose. Any proceeds in escrow, pending such use, may be invested or reinvested in

any items permitted by the state of Colorado and bills, certificates of indebtedness, notes, or bonds which are direct obligations of, or the principal and interest of which obligations are unconditionally guaranteed by, the United States. Such proceeds and investments in escrow, together with any interest to be derived from any such investment, shall be in an amount at all times sufficient as to principal, interest, any prior redemption premium due, and any charges of the escrow agent payable therefrom to pay the bonds being refunded as they become due at their respective maturities or due at any designated prior redemption dates in connection with which the board shall exercise a prior redemption option. Any purchase of any refunding bond issued under this article shall in no manner be responsible for the application of the proceeds thereof by the authority or any of its officers, agents, or employees.

25-8.5-115. Facilities - comprehensive program. (1) The authority, acting by and through the board, may acquire, construct, lease, rent, improve, equip, relocate, maintain, and operate water quality control facilities, any project, or any part thereof for the benefit of the authority and the inhabitants thereof, after the board has made such preliminary studies and otherwise taken such action as it determines to be necessary or desirable.

(2) (a) The authority shall develop a comprehensive program for the water quality control facilities specified in subsection (1) of this section. A comprehensive program may consist of one project or more than one project.

(b) A hearing on the proposed comprehensive program shall be scheduled, and notice of the hearing shall be given by publication and posted in the office of the county clerk and recorder of each member county. Upon closure of the hearing, the board may either require changes to be made in the comprehensive program or the board may approve or reject the comprehensive program as prepared.

(c) If any substantial changes to the comprehensive program are ordered at any time, a further hearing shall be held pursuant to notice which shall be given by publication.

25-8.5-116. Coordination with drainage and flood control measures. (1) Any exercise by the authority of the powers granted by section 25-8.5-111 or 25-8.5-115 which affects drainage and flood control shall be consistent with and conform to the drainage and flood control program of the urban drainage and flood control district adopted pursuant to section 32-11-214, C.R.S., the resolutions, rules, regulations, and orders of the district issued pursuant to section 32-11-218 (1) (e), C.R.S., and any flood plain zoning

resolutions, rules, regulations, and orders of any public body having jurisdiction to adopt the same.

(2) Construction by the authority of drainage or water quality control facilities which might or will affect drainage or flood control within the boundaries of the urban drainage and flood control district shall not be undertaken until a proposal therefor has been presented to and approved by the board of directors of said district. Such proposal shall demonstrate compliance with the requirements of subsection (1) of this section, and the board shall apply the same standards of flood control and drainage criteria for approval thereof as it applies for review of proposals presented for approval pursuant to section 32-11-221, C.R.S. The provisions of section 32-11-221, C.R.S., shall apply to the presentation, consideration, and determination by said board of directors of any such proposal or modification thereof.

25-8.5-117. Transfer of powers. (1) Upon the adoption of the board of directors of the urban drainage and flood control district and the board of directors of the authority created herein of a joint resolution delegating the agreed-upon responsibility to the urban drainage and flood control district for carrying out and meeting, within the district's boundaries, the compliance requirements and the permitting requirements imposed with respect to storm water runoff quality by the federal "Water Quality Act of 1987" and any regulations and standards adopted pursuant thereto or pursuant to state law, all powers contained in this act to deal with water quality control and compliance relating to the agreed-upon aspects of storm water runoff and nonpoint sources of pollution, including financial powers and special assessment powers but not including ad valorem taxation powers, shall be transferred to the urban drainage and flood control district.

(2) Upon the transfer of powers as provided in subsection (1) of this section, any allocation of waste loads affecting storm water runoff or nonpoint sources of pollution proposed or adopted by the authority shall be effective only upon adoption thereof or concurrence therewith by the board of directors of the urban drainage and flood control district.

(3) If the urban drainage and flood control district accepts the responsibility and the transfer of powers as provided in subsection (1) of this section, after completion of a plan for water quality controls by the authority which involves storm drainage runoff or nonpoint sources and after commencement of implementation of such plan, the district shall be bound to carry out the plan as it relates to the storm water and nonpoint source powers transferred to it within the time requirements, if any, of the plan.

25-8.5-118. Power to levy special assessments. (1) The board, in the name of the authority, for the purpose of defraying all the cost of acquiring or constructing, or both, any project or facility authorized by this article, or any portion of the cost thereof not to be defrayed with moneys available therefor from its own funds, any special funds, or otherwise, also has the power under this article:

(a) To levy assessments against all or portions of the property within the authority and to provide for collection of the assessments pursuant to part 6 of article 20 of title 30, C.R.S.;

(b) To pledge the proceeds of any assessments levied under this article to the payment of assessment bonds and to create liens on such proceeds to secure such payments;

(c) To issue assessment bonds payable from the assessments, which assessment bonds shall constitute special obligations of the authority and shall not be a debt of the authority; and

(d) To make all contracts, to execute all instruments, and to do all things necessary or convenient in the exercise of the powers granted in this article or in the performance of the authority's duties or in order to secure the payment of its assessment bonds.

(2) The authority shall give notice, by publication once in a newspaper of general circulation in the authority, to the owners of the property to be assessed, which shall include:

(a) The kind of improvements proposed;

(b) The number of installments and the time in which the cost of the project will be payable;

(c) A description of the properties which will be assessed;

(d) The probable cost per acre or other unit basis which, in the judgment of the authority, reflects the benefits which accrue to the properties, except no benefit shall accrue to agricultural lands, to be assessed;

(e) The time, not less than thirty days after the publication, when a resolution authorizing the improvements will be considered;

(f) A map of the properties to be assessed, together with an estimate and schedule showing the approximate amounts to be assessed, and a statement that all resolutions and

proceedings are on file and may be seen and examined by any interested person at the office of the authority or other designated place at any time within said period of thirty days; and

(g) A statement that all complaints and objections by the owners of property to be assessed in writing concerning the proposed improvements will be heard and determined by the authority before final action thereon.

(3) The finding, by resolution, of the board that said improvements were ordered after notice given and after hearing held and that such proposal was properly initiated by the said authority shall be conclusive of the facts so stated in every court or other tribunal.

(4) Any resolution or order regarding the assessments or improvements may be modified, confirmed, or rescinded at any time prior to the passage of the resolution authorizing the improvements.

25-8.5-119. Inclusion of territory. (1) Any municipality, county, or special district, or any portion thereof, shall be eligible for inclusion upon resolution of its governing body requesting inclusion in the authority and describing the property to be included. The authority, by resolution, may include such property on such terms and conditions as may be determined appropriate by the board.

(2) Upon receipt of a resolution requesting inclusion, the board shall cause an investigation to be made within a reasonable time to determine whether or not the municipality, county, or special district, or portion thereof, may feasibly be included within the authority, whether the municipality, county, or special district has any property which is tributary to the basin, waters, or watersheds governed by the authority, and the terms and conditions upon which the municipality, county, or special district may be included within the authority. If it is determined that it is feasible to include the municipality, county, or special district, or portion thereof, in the authority, and the municipality, county, or special district has property tributary to the basin, waters, or watersheds governed by the authority, the board by resolution shall set the terms and conditions upon which the municipality, county, or special district, or portion thereof, may be included within the authority and shall give notice thereof to the municipality, county, or special district. If the board determines that the municipality, county, or special district, or portion thereof, cannot feasibly be included within the authority or otherwise determines that the municipality, county, or special district should not be included within the authority, the board shall

pass a resolution so stating and notifying the municipality, county, or special district of the action of the board. The board's determination that the county, municipality, or special district, or portion thereof, should not be included in the authority shall be conclusive.

(3) (a) If the governing body of the municipality, county, or special district desires to include the municipality, county, or special district, or portion thereof, within the authority upon the terms and conditions set forth by the board, the governing body shall adopt a resolution declaring that the public health, safety, and general welfare requires the inclusion of said municipality, county, or special district within the authority and that the governing body desires to have said municipality, county, or special district, or portion thereof, included therein upon the terms and conditions prescribed by the board. The governing body of such municipality, county, or special district, before final adoption of said resolution, shall hold a public hearing thereon, notice of which shall be given by publication in a newspaper of general circulation within such municipality, county, or special district, which shall be complete at least ten days before the hearing. Upon the final adoption of said resolution, the clerk of the governing body of such municipality, county, or special district shall forthwith transmit a certified copy of the resolution to the board and to the division of local government in the department of local affairs.

(b) After receipt of a copy of such resolution, the board shall pass and adopt a resolution including said municipality, county, or special district, or portion thereof, in the authority and shall cause a certified copy thereof to be transmitted to the division of local government and a certified copy to the governing body of the municipality, county, or special district.

(4) The director of said division, upon receipt of a certified copy of the resolution of the board, shall forthwith issue a certificate reciting that the municipality, county, or special district, or portion thereof, described in such resolution has been duly included within the authority according to the laws of the state of Colorado. The inclusion of such territory shall be deemed effective upon the date of the issuance of such certificate, and the validity of such inclusion shall not be contestable in any suit or proceeding which has not been commenced within thirty days from such date. The said division shall forthwith transmit to the governing body of such municipality, county, or special district and to the board five copies of such certificate, and the clerk of such governing body shall forthwith record a copy of the certificate in the office of the clerk and recorder of

each county in which such municipality, county, or special district, or portion thereof, is located and file a copy thereof with the county assessor of each such county. Additional copies of said certificate shall be issued by the division of local government upon request.

25-8.5-120. Exclusion of property. (1) Any owner of property within the boundaries of the authority may petition to be excluded from the authority.

(2) In order for such property to be excluded, the board shall determine that the property to be excluded does not receive wastewater treatment services or have an individual sewage disposal system located within the authority and either:

(a) Was improperly included within the authority; or

(b) Is not tributary to the basin, waters, or watersheds governed by the authority or will not benefit from projects or improvements provided by the authority.

(3) Any petition for exclusion shall specify the property to be excluded, and evidence that the property complies with the criteria of subsection (2) of this section.

(4) The authority shall provide notice of the date, time, and place of the authority's meeting to consider the petition for exclusion.

(5) The authority may approve, modify, or deny a petition for exclusion.

(6) If the authority approves a petition for exclusion of property, the authority shall file a copy of said resolution with the division of local government and with the county, municipality, or special district authority members which includes within its boundaries the excluded property, record a copy of the resolution in the office of the county clerk and recorder in the county in which said excluded property is located, and file a copy with the county assessor in such county.

SECTION 2. Safety clause. The general assembly hereby

finds, determines, and declares that this act is necessary for the immediate preservation of the public peace, health, and safety.

Carl E. Bledsoe
SPEAKER OF THE HOUSE
OF REPRESENTATIVES

Ted L. Strickland
PRESIDENT OF
THE SENATE

Lee C. Bahrych
CHIEF CLERK OF THE HOUSE
OF REPRESENTATIVES

Joan M. Albi
SECRETARY OF
THE SENATE

APPROVED April 28, 1988, at 2:35 p m

Roy Romer
GOVERNOR OF THE STATE OF COLORADO

APPENDIX C

5 CCR 1002-19

DEPARTMENT OF HEALTH

WATER QUALITY CONTROL COMMISSION

CHERRY CREEK RESERVOIR

5 CCR 1002-19

EDITORS NOTES *

Authority Cited:
see page 1, rule 4.2.1, Authority

History and Amendments:
Pp. 1-9 adopted 11/6/85, effective 12/30/85, 8 CR 12. Pp. 1-11 adopted 5/1/89, effective 6/30/89, 12 CR 6.

A. G. [redacted]
8 AG [redacted] 12 AG 181

Annotations:

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Adopted: November 6, 1985
Effective: December 30, 1985
Amended: May 1, 1989
Effective: June 30, 1989

4.2.0 CHERRY CREEK RESERVOIR CONTROL REGULATION

4.2.1 AUTHORITY

The Water Quality Control Commission is authorized by C.R.S. 1973, 25-8-205, to promulgate control regulations to limitations on the extent of specifically identified pollutants that any person may discharge into any specified class of state waters.

4.2.2 DEFINITIONS

See the Colorado Water Quality Control Act and other Water Quality Control Commission regulations for additional definitions.

1. "Point source" means any discernible, confined, and discrete conveyance, including, but not limited to, any pipe, ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation, or vessel or other floating craft, from which pollutants are or may be discharged. "Point source" does not include irrigation return flows.

2. "Effluent limitation" means any restriction or prohibition established pursuant to this regulation, the Colorado Water Quality Control Act or the federal act on quantities, rates, and concentrations of chemical, physicial, biological, and other constituents which are discharged from point sources into state waters, including, but not limited to, standards of performance for new sources, toxic effluent standards, and schedules of compliance.

3. "Wasteload allocation" means the portion of a receiving water's loading capacity that is allocated to one of its existing or future point sources of pollution.

4. "Individual sewage disposal system" means a system or facility for treating, neutralizing, stabilizing, or disposing of sewage which is not a part of or connected to a sewage treatment works.

5. "Nonpoint source" means, for the purpose of this regulation, any activity or facility other than a point source from which pollutants are or may be discharged. For the purposes of this allocation, nonpoint source includes all stormwater runoff, whether sheet flows or collected and conveyed through channels, conduits, pipes or other discrete conveyances.

6. "Load allocation" is the portion of a receiving water's loading capacity that is attributed either to one of its existing or future nonpoint sources of pollution or to natural background sources.

7. "Best management practice" means best methods, measures or practices selected by an agency to meet its nonpoint source control needs. Best management practices include, but are not limited to, structural and nonstructural controls and operation and maintenance procedures. Best management practices can be applied before, during and after pollution-producing activities to reduce or eliminate the introduction of pollutants into receiving waters.

8. "Designated management agency" is the agency identified by the water quality management plan and by the Governor to implement specific control recommendations.

9. "Background source phosphorus" includes loading to the reservoir which is not the result of human-related activities, such as groundwater, precipitation on the reservoir and ambient flow.

10. "Cherry Creek Basin" is defined as the area delineated in Figure 1 attached to this regulation.

11. "Authority" means the Cherry Creek Basin Water Quality Authority established pursuant to section 25-8.5-101 et seq., C.R.S.

4.2.3 WASTELOAD ALLOCATION FOR TOTAL PHOSPHORUS DISCHARGE

1. Modeling, using the 1982 hydrologic and water quality data, concluded that the following annual phosphorus loads shall not be exceeded in the Cherry Creek Basin. However, in no event shall these allocations be construed to allow discharges in excess of the requirements of Sections 4.2.5 and 4.2.6 of these regulations.

Nonpoint Sources:	10,290 lbs./yr
Background Sources:	1,170 lbs./yr
Point Sources:	2,310 lbs./yr
Industrial Sources:	50 lbs./yr
Individual Sewage Disposal Systems:	450 lbs./yr
Total Phosphorus:	14,270 lbs./yr

4.2.4 WASTELOAD ALLOCATIONS FOR PHOSPHORUS (lb./yr)

The Division shall not issue discharge permits to the following dischargers which allow effluent limitations exceeding the phosphorus allocations below. However, in no event shall these allocations be

construed to allow discharges in excess of the requirements of Sections 4.2.5 and 4.2.6 of these regulations, unless a credit is granted pursuant to Section 4.2.6(3).

1. DISCHARGE (MAJOR DOMESTIC)	ANNUAL LBS./YR
Arapahoe Water and Sanitation District	354
Cottonwood Water and Sanitation District	213
Denver Southeast Suburban Water and Sanitation District	365*
Inverness Water and Sanitation District	68
Meridian Metropolitan District	114
Parker Water and Sanitation District	533
Stonegate Center Metropolitan District	53
Castle Rock (Mitchell Creek Plant)	128
Castle Rock (Cherry Creek Plant)	21
Castle Rock (McMurdo Gulch Plant)	64
Rampart Range	160
Castle Rock (Newlin Gulch)	86
Total:	2,159

The above listing of various pounds per year for the listed dischargers is not deemed to be the grant of a property right for any number of pounds, and such allocations may be changed by the commission upon good cause shown during regular reviews of this regulation.

*The present facility at Denver Southeast Suburban Water and Sanitation District requires 365 pounds of phosphorus annually. The 365 pound phosphorus allocation to Denver Southeast is temporary and shall be reduced to 213 pounds of phosphorus in 1990 or when Denver Southeast completes construction of their 1.4 MGD facility, whichever occurs first.

2. DISCHARGE (INDIVIDUAL SEWAGE DISPOSAL SYSTEMS)

Individual sewage disposal systems are allocated no more than four hundred and fifty (450) pounds of phosphorus annually.

3. DISCHARGE (INDUSTRIAL)

Fifty (50) pounds of phosphorus are allocated for industrial discharges.

4. Reserve Pool

A "reserve Pool" with 303 pounds of phosphorus shall be retained, for future allocation by the Commission as a reserve pool or otherwise. Initially, the reserve pool is 151 pounds per year, which will increase to 303 pounds per year after the allocation to Denver Southeast drops to 213 pounds as defined in Section 4.2.4(1).

4.2.5 MUNICIPAL, DOMESTIC AND INDUSTRIAL EFFLUENT LIMITATIONS

1. Notwithstanding the allocations specified in Section 4.2.4, no point source within the Cherry Creek basin shall discharge an effluent with a total phosphorus concentration greater than 0.5 mg/l total phosphorus, as a maximum instantaneous concentration, or a 30-day average greater than 0.1 mg/l. The maximum 30-day average phosphorus discharge of 0.1 mg/l shall only be allowed from October through March. From April through September no point source shall discharge effluent with a total phosphorus concentration greater than 0.05 mg/l as a 30-day average.

2. Whenever a discharger requests a compliance schedule in connection with a permit issuance or permit renewal, the discharger shall (on the same date) notify the Authority of that request and shall solicit Authority comments and shall submit evidence of that notice to the Division. The Division shall not take final action on any compliance schedule until Authority comments are received or 45 days after the date that notice was provided to the Authority, whichever occurs first. This provision shall not apply in the case of minor modifications to permits as defined by section 6.9.3(10), 5 CCR 1002-2.

3. Phosphorus allocations for site approvals and permits issued to facilities within the Cherry Creek basin shall be based on total phosphorus effluent quality of 0.1 mg/l or better for a thirty-day average for October through March and a total phosphorus effluent quality of 0.05 mg/l for a 30-day average for April through September, at the design capacity of the treatment facility.

4.2.6 CONTROL OF NONPOINT SOURCES

1. Best management practices, to limit nonpoint source pollution, will be implemented by local governments, as outlined in the Cherry Creek portion of the 208 Water Quality Plan.

2. Counties, municipalities and districts in the Cherry Creek Basin which have responsibility for stormwater management, shall remove a minimum of 50% of the phosphorus contained in stormwater runoff in the entire basin by January 1, 1992. The choice of runoff control measures shall be made at the local level, and may be accomplished by individual counties, municipalities, or districts, or jointly.

   The Water Quality Control Division shall report periodically but at least within one year to the Water Quality Control Commission on the progress made by the stormwater management authorities, including a review of water quality data, and shall recommend any additional controls for nonpoint sources of phosphorus necessary to maintain stream classifications and water quality standards.

3. If nonpoint source control projects demonstrate that more than fifty percent (50%) average-annual basin wide phosphorus is removed, phosphorus credits may be granted in the future for a reserve pool, additional point source projects or nonpoint source projects.

4. If the nonpoint source control projects remove less than fifty percent (50%) average annual phosphorus basin wide, the Commission can adjust the phosphorus allocations outlined in Section 4.2.3 and 4.2.4 of this regulation.

4.2.7 MONITORING OF PHOSPHORUS

1. Point Sources: All permits for point source discharges shall be consistent with the requirements of Section 4.2.4 and 4.2.5. These requirements shall provide for a maximum instantaneous, 7-day average and 30-day average measurements of phosphorus concentrations and loadings. The monitoring reports shall be filed once per month.

2. Nonpoint sources: The designated management agency shall provide for monitoring nonpoint source controls to determine phosphorus removal efficiencies.

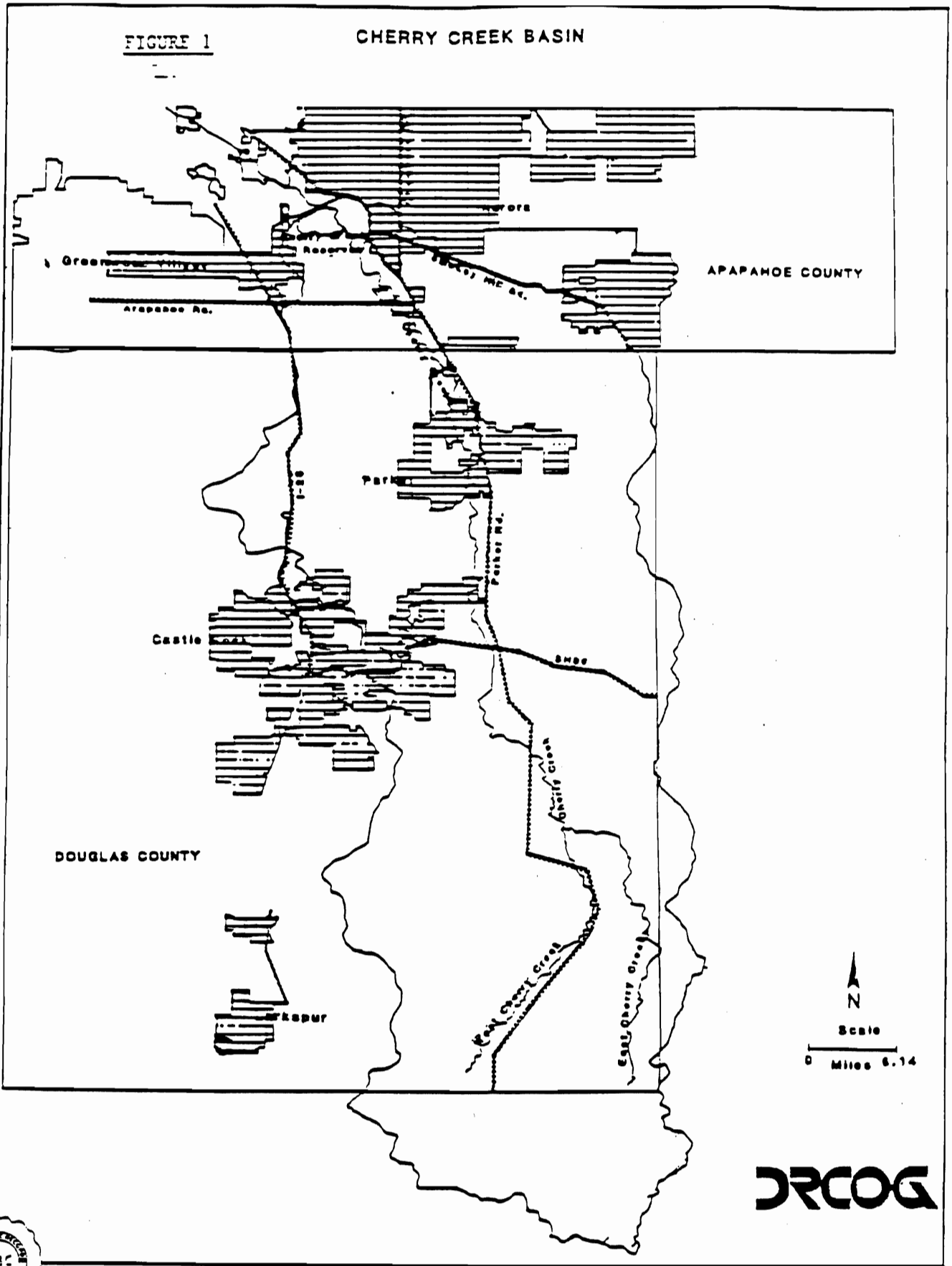
4.2.8 COMMISSION REVIEW

1. The Commission shall receive annually a report on the activities of the Authority, the funding of nonpoint source control projects, the site applications approved and the related maximum amount of point source and nonpoint source pounds expected thereby.

2. The annual report must demonstrate that reasonable further progress towards nonpoint source control is being made and shall include evidence of decisions and/or agreements for the financing of nonpoint source control projects and the adoption and implementation of best management practices by local governments.

FIGURE 1

CHERRY CREEK BASIN



4.2.9 BASIS AND PURPOSE

The Colorado Water Quality Control Commission adopted a phosphorus standard of 0.035 mg/l for Cherry Creek Reservoir on August 14, 1984. The Statement of Basis and Purpose for the 0.035 mg/l phosphorus standard (5 C.C.R. 3.8.11) notes that the standard was based upon water quality data and hydrologic conditions of 1982.

Control of both point and nonpoint sources of total phosphorus is essential to protect the quality and uses of Cherry Creek Reservoir over the long term. This regulation is based on a state-local partnership in controlling total phosphorus. This relationship is described in the Upper Cherry Creek Basin Water Quality Management Plan. These regulations provide the basis for state actions in protecting Cherry Creek Reservoir's quality. Local regulations will be used to control nonpoint sources. Taken together, these state and local regulations provide a mechanism for protecting the quality of Cherry Creek Reservoir, given modeling based upon the hydrologic condition of 1982.

Total phosphorus loading varies with the water yield from the Cherry Creek basin watershed. For the purpose of determining progress in achieving phosphorus controls, 1982 will be used as the base year. Mathematical relationships contained in the Cherry Creek Clean Lakes Study will be used to index future yields of phosphorus to the 1982 base year. At higher water yields the totals phosphorus loading and inlake concentrations may be exceeded. The 14,270 pounds equate to the inlake total phosphorus standard of 0.035 mg/l as a growing season average, and an inlake chlorophyll a concentration of 15.0 ug/l.

Total annual phosphorus pounds of 14, 270 are based upon the number and type of wastewater treatment facilities and land uses described in the Upper Cherry Creek portion of the 208 Water Quality Plan. These total annual pounds of phosphorus were determined through the use of the Canfield-Bachman model as described in the plan.

The allocation of phosphorus pounds for point source discharges are predicated upon nonpoint source controls, as outlined in Section 4.2.6, being implemented throughout the basin and effectively removing 50% of the nonpoint source pollution. The purpose of Section 4.2.6(2) is to encourage a basin-wide approach to phosphorus controls. If the requirements of this provision are not met the Commission will consider the adoption of control regulations or permit requirements to insure compliance.

4.2.10 FISCAL IMPACT STATEMENT

The fiscal impact statement from the phosphorus standard on Cherry Creek Reservoir defined estimated benefits of the adopted standard. The master plan does not readdress the benefits of the standard but does define the costs of providing wastewater treatment and storm water treatment in the basin. To reduce phosphorus loads from nonpoint sources, the plan estimates a total cost of $2 to 4 million per year. The initial phase of sub-basin contracts for five sub-basins will have an annual cost of one million dollars per year. These costs will be borne by the residents of the basin since there is no known outside source of funding.

The point source costs are based on providing capacity up to the estimated phosphorus loading limit. This limit of 14.4 mgd is much less than the capacity needed to support buildout of the basin but was used in the plan until other methods of phosphorus control (primarily nonpoint) can be identified.

To provide that amount of capacity in the basin is estimated to cost $30-35 million dollars on an annualized basis, including both capital and operation and maintenance costs. Estimating the portion of that cost that is strictly for phosphorus removal is very difficult since some phosphorus removal will occur in secondary treatment plants. Also the land application systems in the basin plan are used for water resources management regardless of the phosphorus removal benefit. However, the analysis suggested that plan components added strictly for phosphorus removal account for approximately 10 percent of the capital costs and the operating and maintenance costs of about 3 to 3.5 million dollars per year.

These costs fall within the range of benefits estimated by the Commission for the reservoir. It should be noted that the costs and benefits do not always fall upon the same individuals. The costs will be the responsibility of the basin residents and landowners while the benefits will primarily accrue to those persons, both in and out of the basin, who directly enjoy the beneficial uses of the reservoir.

4.2.11 STATEMENT OF BASIS, SPECIFIC STATUTORY AUTHORITY, AND PURPOSE (1989 REVISIONS)

The provisions of sections 25-8-202(1)(c), (h) and (2); and 25-8-205; C.R.S., provide the specific statutory authority for adoption of the attached regulatory amendments. The Commission also adopted, in compliance with sections 24-4-103(4) C.R.S., the following statement of basis and purpose.

BASIS AND PURPOSE:

In 1988, the Water Quality Control Division and the Cherry Creek Basin Water Quality Authority recommended that the Water Quality Control Commission consider revising this control regulation for the purpose of:

1. Clarifying section 4.2.5 so that the requirements for phosphorus controls in point source discharge permits are clear as to how and when these limits apply,

2. Extension of the compliance date for 50% removal of phosphorus contained in stormwater runoff from October 1, 1988 to January 1, 1992 in section 4.2.6,

3. Eliminating provisions in section 4.2.8 which are outdated or no longer apply.

The rationale for the change in section 4.2.5 is based on the conclusions of the Cherry Creek Basin Master Plan, which was approved by the Commission in 1985 but the recommended point source control strategy in that plan was not stated specifically in the control regulation.

The compliance date of October 1, 1988 for 50% removal of stormwater runoff source of phosphorus was not realistic in terms of the timeframe allowed for both construction of control structures and monitoring of their relative effectiveness. There is a lack of data to substantiate the effectiveness of recommended best management practices in the 1985 Master Plan. Until control structures can be built and monitored, and an extension of the compliance date in section 4.2.6 (2) appears reasonable.

Section 4.2.8 contained provisions which expressed the Commission's intent to review progress in controlling phosphorus within the Basin after the first two years of the control regulation being in effect. The two year review by the Commission has taken place. The intergovernmental agreement which formed the Cherry Creek Basin Authority in 1985 is no longer in effect because the Basin Authority is now authorized by legislation adopted by the General Assembly in 1988. Other statements in this section, paragraphs 3, 4, 5, and 6 were outdated or do not relate specifically to enforceable provisions of this control regulation and hence have been deleted.

New section 4.2.5(2) was added to address the concern raised by the Cherry Creek Basin Water Quality Authority that the Authority was not being provided adequate notice and opportunity to comment on compliance schedules for permits and enforcement actions involving dischargers in the Basin. The provision states that, where a discharger requests a compliance schedule in connection with permit issuance or renewal, the discharger must simultaneously notify the Authority of the request. The discharger also is required to submit evidence of the notification to the Division and to solicit comments on the compliance schedule from the Authority. With respect to compliance schedules referred to in this provision, the Division shall not take final action until at least 45 days after the date that notice of the request for a compliance schedule was provided to the Authority, unless comments from the Authority are received earlier. This provision does not include minor modifications to permits, which consist of such items as correcting typographical errors and changing interim dates in compliance schedules.

With regard to permit-based compliance schedules not requested by the discharger, these would be in the form of draft permits released to public notice by the Division. The normal public comment period for permits (except where a public meeting is held) is 30 days. Upon request by the Authority, however, the Division would extend that period to allow for comment by the Authority, as allowed by section 6.6.2(3) (5 CCR 1002-2).

An issue was raised at the hearing concerning notification of the Authority where the Division or discharger proposed a compliance schedule as part of a Division enforcement action, or resolution thereof. The Division expressed a concern regarding a set time limitation of 45 days as contained in section 4.2.5(2), on the basis that this might unduly hamper the Division's ability to address enforcement situations. The Division made it clear at the hearing, however, that it would have no objection to the Authority being informed of such compliance schedules and would provide to the Authority a copy of enforcement-related orders containing such compliance schedules.

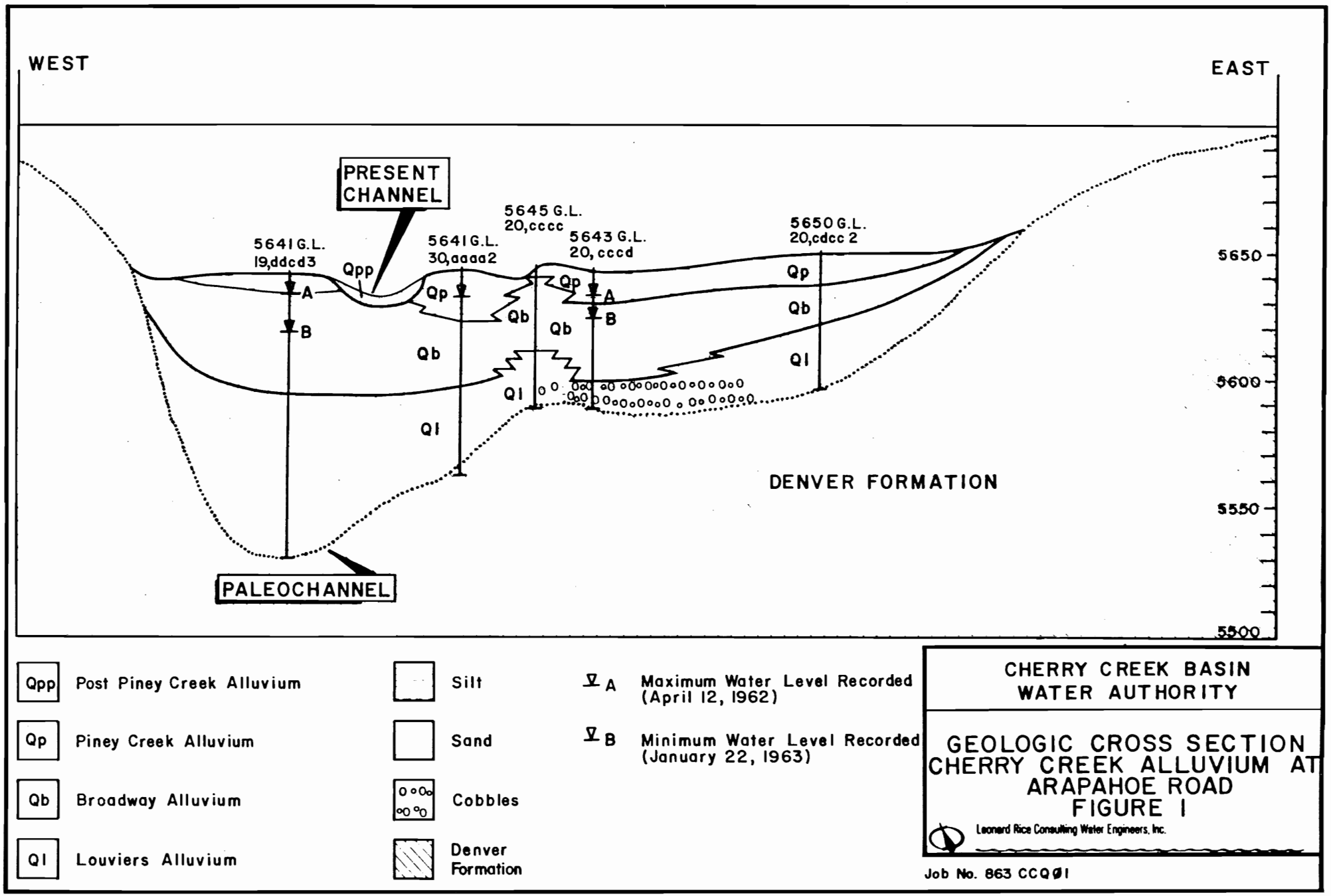
As revised, section 4.2.8 provides that the Commission is to receive an annual report regarding the activities of the Authority. At the hearing, the Authority agreed to prepare the annual report, so long as it is understood that it will contain the same level of detail as in the past. This is the Commission's understanding and intent.

Two minor changes have been made to section 4.2.2. The definition of "Cherry Creek Basin" has been revised to refer to a map that will be incorporated into the regulation. Second, a definition of the term "Authority" has been added.

Finally, the title of the regulation has been shortened, for ease of reference.

APPENDIX D

CHERRY CREEK BASIN
GEOLOGIC CROSS SECTION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Ql
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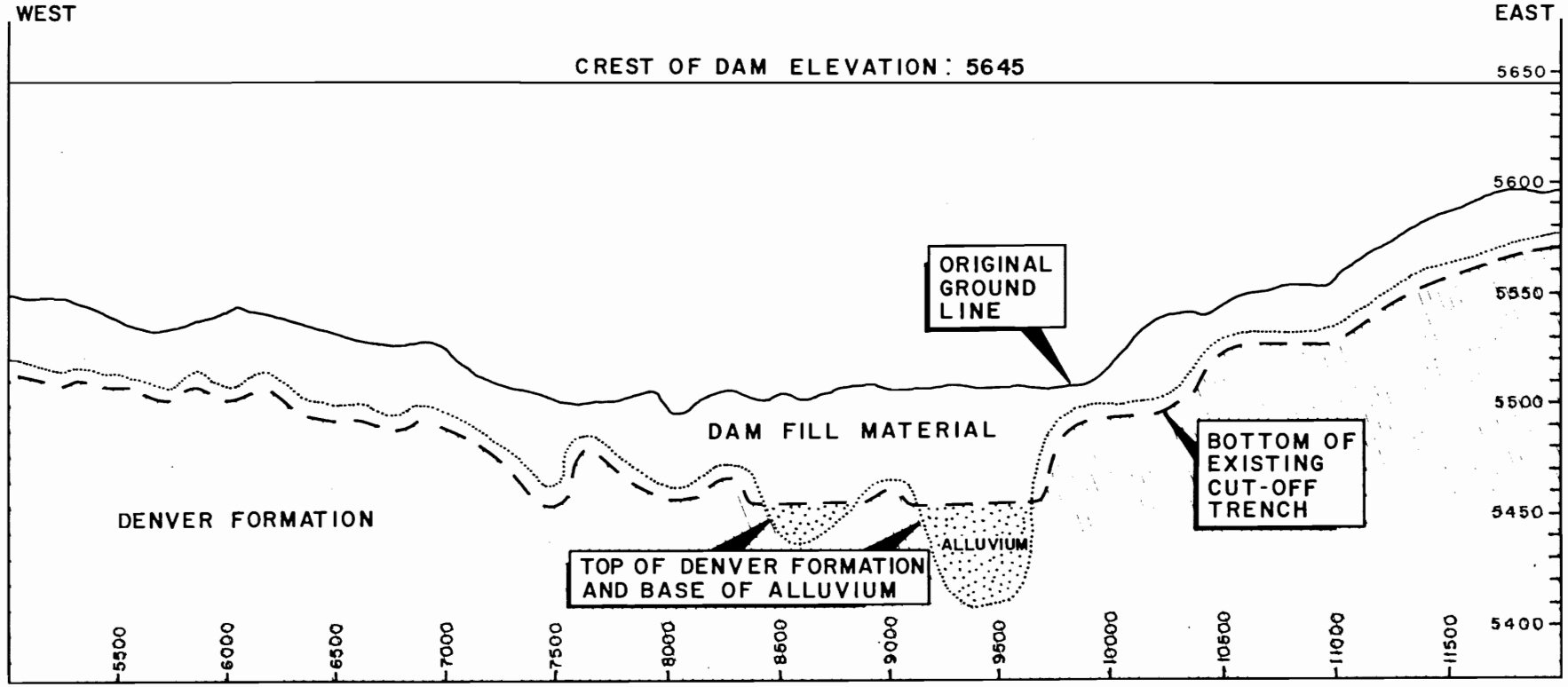
B
DENVER FORMATION
5650
5600
5550
5500
Qpp Post Piney Creek Alluvium
Qp Piney Creek Alluvium
Qb Broadway Alluvium
Ql Louviers Alluvium
Silt
Sand
Cobbles
Denver Formation
A Maximum Water Level Recorded (April 12, 1962)
B Minimum Water Level Recorded (January 22, 1963)
CHERRY CREEK BASIN WATER AUTHORITY
GEOLOGIC CROSS SECTION CHERRY CREEK ALLUVIUM AT ARAPAHOE ROAD
FIGURE 1
Leonard Rice Consulting Water Engineers, Inc.
Job No. 863 CCQ01



CHERRY CREEK BASIN
WATER AUTHORITY

GEOLOGIC CROSS SECTION
ALONG CHERRY CREEK DAM

FIGURE 2

Leonard Rice Consulting Water Engineers, Inc.

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