MISSOULA WASTEWATER FACILITIES PLAN UPDATE

CHAPTER 1
Executive SUMMARY

In the 1980s, the City of Missoula made numerous improvements to the wastewater collection and treatment system. However, to continue to protect the Clark Fork River and the Missoula Valley Aquifer, as well as to accommodate growth, it is necessary that the City plan for future wastewater system extensions and upgrades. This wastewater facilities plan defines the condition of the existing infrastructure and describes improvements necessary to protect water resources for the next 50 years.

Chapter 1 presents an executive summary of the Missoula Wastewater Facilities Plan Update. This executive summary briefly describes the chapter contents of this document.

CHAPTER 2—INTRODUCTION

The objective of the Missoula Wastewater Facilities Plan is to develop a publicly acceptable, affordable plan for managing wastewater facilities to protect the environment, specifically the Missoula Valley Aquifer and the Clark Fork River. To implement this objective, the City of Missoula and Missoula County require a plan that defines the boundaries of the sewer service area, identifies the collection system technology and wastewater treatment needs, and defines a capital improvement program including budget and schedule.

Chapter 2 introduces the major issues considered in the Missoula wastewater facilities planning effort. These issues include growth management, surface water protection, groundwater protection, cost and affordability, annexation, sewer extension policy, sewer configuration, and public communication. In this section, the major objectives of the planning process are also defined, which consist of the following:

- Develop an effective communication plan for conducting the facility planning effort within the Missoula "operating environment
- Plan for wastewater treatment to protect the Clark Fork River.
- Plan for serving un-sewered areas with a wastewater collection and treatment system.
- Designate appropriate alternate sewer systems for use in compatible areas.

Public Communication

The Wastewater Facilities Plan Update involves technical considerations that will have a continuing impact on the community. External factors, which can be defined as an "operating environment," will have a distinct effect on the wastewater facilities plan results. To focus the "operating environment" on wastewater planning efforts, it was necessary that a communications plan be developed. The purpose of the communications plan was to identify interested stakeholders, potential issues, and relational standards.

Wastewater Advisory Group. As an initial step in the communication and involvement process, a Wastewater Advisory Group, consisting of staff representatives from City and County Departments, was created in April 1995. Meeting once a month, their role differed from the traditional technical advisory committee in that their expertise included social, economic, and legal backgrounds.

Preliminary Scoping and Data Collection. During the first phase of the planning effort, preliminary scoping and data collection, input was solicited from interested stakeholders. The consultants continued monthly meetings with the Wastewater Advisory Committee. On a periodic schedule, the consultants also received input from the Growth Management Task Force and provided updates. The Growth Management Task Force consisted of City and County elected officials and business community and neighborhood representatives, and was created in 1994 to provide a forum for collaborative discussion about issues related to growth. The Growth Management Task Force viewed the Wastewater Facilities Plan Update as a useful tool for managing growth rather than a response to growth.

In June 1995, an educational mailer/response form packet was sent to approximately 300 parties describing the facilities planning process and asking for assistance in identifying critical issues and evaluation criteria for alternatives in the Wastewater Facilities Planning process. Mini-scoping meetings were also held in June and July with the Missoula City/County Growth Management Task Force, the Advisory Group, and the Wastewater Facilities employees.

A traveling display explaining the process and asking for input was located throughout the city between June and September at the City/County Library, City Hall, the County Courthouse, Southgate Mall, and the County Fair. Based on an interview with the City Engineer and the consultant, the Missoulian carried a news article announcing the beginning of the process, a schedule for public involvement activities, and a brief discussion related to water quality and wastewater treatment, as well as the complexities of City and County boundaries. A Wastewater Facilities booth at the fall, 1995 Missoula "Future's Fair" provided another opportunity to explain the process to the public and ask for their comments on issues and evaluation criteria for alternatives.

Alternatives Development. During the second phase of the planning effort, alternatives development, regular meetings continued with the Wastewater Advisory Committee, as well as periodic working sessions with the Growth Management Task Force. After developing the five alternatives described in Chapter 7, a second mailer/response form packet, describing the proposed wastewater management approaches, was distributed. The traveling display was also updated to explain the alternatives and was rotated among visible locations in spring, 1997. Briefings were also given to the Missoula City Council, Missoula County Commissioners, and Missoula Planning Commission. This phase of the public communications process culminated with three public open house sessions conducted in May 1997. In selecting the recommended wastewater management alternative, the Wastewater Advisory Committee used feedback obtained through this public communications process.

Chapter 3—Population and Wastewater Characteristics

To plan for future wastewater facility needs, it is necessary to project the amount of wastewater that will be received and treated. Wastewater quantity is influenced by the population served, the magnitude of commercial activities, and the quantity of extraneous flow, such as sewer system infiltration and inflow. To plan treatment facilities, it is also necessary to identify wastewater characteristics, including the organic and suspended solids content as well as nutrients (nitrogen and phosphorus). These characteristics define the required capacity for secondary treatment processes and solids handling facilities. An additional consideration is that, in the future the City will be required to reduce nutrient discharges. A final element of the projections is, therefore, the amount of nitrogen and phosphorus that will be received by the wastewater treatment facilities. The purpose of this chapter is to identify current wastewater quantities and characteristics, and to project future conditions.

Findings

This chapter presents population projections and an analysis of existing flow and loading conditions. From this information, a projection of future conditions has been developed. Key findings included the following:

- Significant growth has been projected for the Missoula sewer service area. Study area population and employment are projected to nearly double over the next 50 years.
- The residential per capita wastewater contribution is comparable to standard design values, although on the high end of the normal range.
- Missoula is a center of commercial activities. Commercial activities appear to contribute one-quarter of the wastewater quantity and 40 percent of the organic, solids, and nutrient loadings.
- Commercial, industrial, and institutional wastewater loadings are proportional to employment.
- If the entire study area were to be served by central wastewater treatment facilities, the wastewater flow is projected to nearly double over the 50-year horizon, while the loadings would increase by 150 percent of the existing values.

Chapter 4—Future Conditions

Changing water quality regulations dictate that the City of Missoula undertake modifications to improve treated wastewater effluent quality. The State of Montana Department of Environmental Quality has performed an assessment study of the Clark Fork River Basin. The study revealed that nitrogen and phosphorus discharges, from a variety of sources including wastewater discharges, have a significant deleterious impact on surface water quality. Consequently, the State and interested stakeholders have developed water quality goals and a voluntary program to remove nutrients from wastewater effluent discharges.

The purpose of Chapter 4 is to identify current water quality concerns and define wastewater management techniques to correct water quality deficiencies. A goal of this chapter is to develop an approach for evaluating wastewater treatment process options in concert with the development of receiving water criteria and wasteload limitations.

Final Voluntary Nutrient Control Program (VNRP) June 15, 1998

The Tri-State Implementation Council, Nutrient Target Subcommittee published the final "Clark Fork River Voluntary Nutrient Reduction Program" on June 15, 1998 following an extensive period of review, revisions, and discussion. The final "Clark Fork River Voluntary Nutrient Reduction Program" establishes point and nonpoint source load reductions to meet the in-stream nutrient and algal targets developed in the VNRP process. This includes phosphorus and nitrogen load reduction targets for the City of Missoula wastewater discharge. The Missoula Wastewater Treatment Plant is initially required to reduce phosphorus and nitrogen discharges by 55- and 30-percent respectively over 1992 loadings (prior to nutrient removal experimentation). Future removal requirements will increase as the treatment plant processes more wastewater.

The final "Clark Fork River Voluntary Nutrient Reduction Program" also includes a reduction goal for Missoula area ground water loadings from septic systems. A target was set for connecting 50 percent of the existing 6,780 septic systems in the Missoula urban area to sewers within the next 10 years to reduce nitrogen discharged to the Bitterroot and Clark Fork Rivers by an estimated 130 kg/day (286 lb/day).

A VNRP Memorandum of Understanding was signed on August 20, 1998 by the following parties:

- · Montana Department of Environmental Quality

- Butte Silver-Bow
- City of Deer Lodge
- City of Missoula
- Stone Container Corporation
- Clark Fork-Pend Oreille Coalition
- Missoula City/County Health Department Board of Health
- Board of County Commissioners, Missoula County
- Tri-State Implementation Council

The VNRP sets ten years from the date of signatures by the parties to the memorandum of understanding to achieve the in-stream nutrient and algal targets. Interim evaluations are planned at least every three years.

Effluent Discharge Permit

The Montana Department of Environmental Quality has recently issued a new effluent discharge permit for the City of Missoula, effective October 1, 1998. The effluent requirements section includes annual average total phosphorus and total nitrogen load requirements linked by a footnote reference to the Clark Fork River Voluntary Nutrient Reduction Program. Compliance is essential to avoid mandatory limits imposed by federal and state agencies.

Chapter 5—Existing Wastewater Collection Facilities Evaluation

To serve a growing community in an environmentally acceptable manner, wastewater must be reliably collected and conveyed to treatment facilities. The City of Missoula is served by a wastewater collection system consisting of gravity sewers, conventional wastewater pumping stations, and septic tank effluent pump (STEP) units. The collection system currently serves most of the core urban area. However, some densely populated locales along Reserve Street, as well as other urban areas (Rattlesnake Valley, East Missoula, Westview Park, Mullan Road, and West Riverside), do not have wastewater service and utilize on-site septic systems.

The objective of this chapter is to describe existing conveyance facilities, to identify deficiencies that may require correction, and define desirable and undesirable characteristics that should be considered in the design of future facilities.

Infiltration and Inflow Analysis

The existing sewer system is subject to infiltration and inflow. Infiltration is the unintentional entry of ground water into the wastewater collection system from surrounding soil. Infiltration is indicated when high wastewater flow is sustained for extended periods. Common points of entry typically include broken pipe and defective joints, as well as cracked manholes. For infiltration to occur, the ground water level must generally be situated above the collection system, so that water is forced into the sewer. In Missoula, the ground water table rises in spring as the Clark Fork River flow increases due to snowmelt.

Inflow primarily consists of rainwater that enters the collection system through roof drains, foundation drains, catch-basin connections, and manholes cover holes in flooded streets. Inflow may also include cooling water discharges. Storm inflow is distinguished from infiltration by the rapidity with which inflow begins and ends after a period of rainfall.

Infiltration and inflow are concerns because they consume useful capacity in the conveyance system and treatment facilities. Excessive levels may also dilute wastewater and cause treatment plant performance to deteriorate.

An updated evaluation determined that neither infiltration nor inflow is excessive. However, isolation and removal is recommended as a means to manage wastewater system hydraulic capacity. Also, high infiltration rates may be symptomatic of declining infrastructure condition.

Hydraulic Analysis

A hydraulic analysis of the sewer system, using a computer model, indicates that the sewer system has adequate capacity for existing (1995), non-storm conditions. The modeling results are supported by sewer system Operations Staff, who has not observed any non-storm constrictions.

However, overflows or constrictions may become apparent during periods of significant rainfall or snowmelt. A constriction was observed in the Bellevue Interceptor during the high flows of February 1996, confirming hydraulic modeling. Modeling indicates that other storm weather constrictions exist in the River Road Interceptor, the Broadway Interceptor, the Momont Interceptor, and Downtown collectors.

Wastewater Pumping Stations

In Missoula, nine major pumping stations currently serve as key components of the wastewater collection system. Reliability of these stations is necessary to ensure that wastewater is continuously conveyed to the wastewater treatment plant for processing. Most facilities are packaged, below grade, dry well/wet well units. These facilities are well operated and maintained. However, the design of these facilities limits operator safety (access and ventilation) and operations and maintenance activities. The pumping stations were generally found to be in good condition. Most facilities are functioning properly, while some have reached the end of their useful life and need to be replaced.

Septic Tank Effluent Pump (STEP) Collection System

Currently, over 1,500 Missoula sewer customers are served by septic tank effluent pump (STEP) systems. The initial facilities were constructed in 1992 and 1993 to serve the Wapikiya, Bellevue, and Cold Springs areas. These neighborhoods are situated in relatively flat areas, with extensive utilities, roadways, and landscaping. The small diameter and variable grade characteristics of the STEP pressure mains eased installation and minimized conflicts with existing features. However, some operational issues have been encountered with STEP systems. Community STEP systems have also been installed. These require more frequent removal of solids.

Chapter 6—Existing Wastewater Treatment Facilities Evaluation

Chapter 6 Wastewater Treatment Plant Evaluation includes an analysis of the existing Missoula wastewater treatment plant and presents a base approach for upgrading the treatment plant for nutrient removal with adequate capacity to serve near-term demands. The results of that analysis are summarized as follows:

- The existing treatment plant is operating below its hydraulic design loading, but above the organic and solids design loadings. Current effluent quality performance is excellent.

- Treatment plant loadings have increased as new connections have been made. Influent wastewater strength characteristics are the subject of continuing monitoring and investigation.
- Implementation of the Clark Fork River Voluntary Nutrient Reduction Program (VNRP) will require improvements to the plant to upgrade treatment to provide further nutrient removal.
- Design development studies are recommended to formulate the detailed configuration, design criteria, and final sizing for the biological nutrient removal process.

CHAPTER 7—WASTEWATER MANAGEMENT PLAN ALTERNATIVES

To protect the Missoula Valley Aquifer and the Clark Fork River, extension and upgrade of wastewater facilities is necessary. The purpose of this chapter is to identify and evaluate feasible wastewater management alternatives.

Description of Alternatives

Five wastewater management alternatives have been identified. These consist of the Existing Service Area, Central Treatment, Satellite Treatment Plants, Dispersed Treatment Plants, and Relocated Treatment Plant alternatives.

Alternative A—Existing Service. In the Existing Service alternative, the present wastewater collection system would continue to serve the existing service area. This alternative would maintain the 1984 Facilities Plan City/County Service Area. The key feature is the concentration of a central plant serving an historically agreed upon area. This alternative presents the least investment in central wastewater facilities.

The advantages of this alternative are that it provides wastewater management to the 1984 Facilities Plan City/County Service Area, consisting of the incorporated City, the most densely populated portions of East Missoula, Linda Vista, and the South Hills. This configuration extends sewer service to areas within the City that are currently on septic systems, and upgrades the existing plant to advanced wastewater treatment for nitrogen and phosphorus control.

The primary disadvantage of Alternative A is that it does not provide sewer collection system capacity or treatment capacity for sewer service extension to other urban areas in Missoula. Other limitations are that it does not provide service to the Wastewater Facilities Service Area developed by the Growth Management Task Force, limits advanced treatment for nitrogen and phosphorus control to the existing 1984 Facilities Plan City/County Service Area, and provides limited reduction in groundwater nitrogen contributions from septic systems. This alternative is reactive to growth in Missoula, rather than a planned approach to growth and future needs. Outlying areas with failing septic systems would not be served.

Alternative B—Central Treatment. In the Central Treatment alternative, all wastewater would be routed to a central wastewater treatment plant. The existing sewer system and treatment plant would be expanded to provide capacity for service to the Wastewater Facilities Service Area, as developed by the Growth Management Task Force. This approach achieves economies of scale by building upon the historical investment in facilities.

Five permutations of Alternative B were developed to address the options for controlling wastewater nutrients. Alternative B.1 is based on the implementation of biological nutrient removal at the Missoula Wastewater Treatment Plant. Alternative B.2 would use seasonal land application to divert nutrients from the Clark Fork River. Alternative B.3 would include pumping facilities to convey wastewater effluent for reuse at the Stone Container Corporation mill. In Alternative B.4, constructed wetlands would be used to remove nutrients. It is uncertain whether this alternative could meet the phosphorus effluent limits.

Alternative B.5 would include effluent filtration, which may be required in the event that either more stringent discharge requirements are necessary to meet the proposed total maximum daily loading or if production of Class A reclaimed water is desired.

The advantages of Alternative B are that it achieves economies of scale by building upon the historical investment in facilities by expanding the existing system. It includes extension of sewer service to areas within the City that are currently on septic systems and the upgrading of the existing plant to advanced treatment for nitrogen and phosphorus control. The alternative also allows for future expansion to the 1999 Wastewater Facilities Plan Study Area boundary. Operational effort and maintenance is concentrated on a single, central facility. Septic system contributions of nitrogen to the Clark Fork and Bitterroot rivers would be reduced.

The primary disadvantage of the Central Alternative is that it utilizes an effluent discharge on the Clark Fork River located on a water quality limited, 303(d) listed stream segment, with a total maximum daily load (TMDL). It requires that the effluent discharge permit be renewed with expanded loading limits. Another disadvantage is that the wastewater management system is constrained by the current configuration of the sewer system and existing location of the wastewater treatment plant, which: (1) limits the ability of immediate receiving waters to assimilate wastewater effluent; (2) affects changing land uses surrounding treatment plant; and (3) requires collection system pumping to return wastewater generated in areas downgradient of the existing treatment plant.

Alternative C—Satellite Treatment. In the Satellite Treatment Plan alternative, the existing wastewater treatment plant would continue to provide service to a portion of the study area. To extend service, three additional wastewater treatment plants would be constructed, one in East Missoula, one along the Bitterroot River, and one near O'Keefe Creek, in addition to expansion of the existing plant. This configuration decentralizes service by using four treatment centers to serve the Wastewater Facilities Plan Study Area boundary. The Satellite alternative also allows decentralized management, including potential ownership of one or more satellite treatment plants by Missoula County.

The advantages of this alternative are that it distributes effluent discharge loadings to multiple surface water locations, including downstream on the Clark Fork River at O'Keefe Creek, extends sewer service to areas within the City that are currently on septic systems, upgrades the existing plant to advanced treatment for nitrogen and phosphorus control, and allows for future expansion to the 1999 Wastewater Facilities Plan Study Area boundary.

The primary disadvantages of this approach are that it requires regulatory approval of new effluent discharge permits on water quality limited, 303(d) listed streams, requires siting and land acquisition for new treatment plants, requires capitalization of new treatment centers, and spreads the operational effort and maintenance to multiple locations and facilities.

Alternative D—Dispersed Treatment. In the Dispersed Treatment Plant alternative, the existing wastewater treatment plant would continue to provide service to the core urban area. Service to outlying areas would be provided through the construction of remote facilities consisting of lagoons coupled with land application sites. With this approach, sewer service is extended by providing 11 new aerated lagoon treatment plants with effluent land application (approximately 10,000 acres), in addition to the existing plant. Alternative D allows wastewater service to be decentralized and removes effluent discharges from the river by using multiple treatment centers with land application.

An advantage of this approach is that it reduces nitrogen and phosphorus loadings to the Clark Fork River. It also allows sewer service to be provided to outlying areas not connected with the central sewer collection system and avoids National Pollutant Discharge Elimination System (NPDES) discharge permitting for the land application treatment systems. The Dispersed Treatment alternative also provides

sewer service to areas within the City that are currently on septic systems, upgrades the existing plant to advanced wastewater treatment for nitrogen and phosphorus control, and allows for future expansion to the 1999 Wastewater Facilities Plan Study Area boundary.

The primary disadvantage of this concept is that it requires large amounts of land for application of wastewater (approximately 10,000 acres) for self-contained treatment centers. It also requires a significant investment in off-season storage lagoons for self-contained treatment centers. A further complication is that agriculture and land management activities, such as operation of irrigation facilities and crop production, are incorporated into the wastewater utility management effort. This approach allows sewer service to be provided to outlying areas not connected with the central sewer collection system and spreads the operational effort and maintenance to multiple locations and facilities.

Alternative E—Relocated Treatment. In the Relocated Treatment Plant alternative, a new central wastewater treatment plant and interceptor sewer would be constructed to provide service to the core urban area. Service to outlying areas would be established through sewer extensions. The existing wastewater treatment plant would be abandoned.

The advantages of Alternative E are that it achieves economies of scale by building upon a single treatment plant. However, the sunk investment in the existing facility would be lost. This alternative includes extension of sewer service to areas within the City that are currently on septic systems and the upgrading to advanced treatment for nitrogen and phosphorus control. The alternative also allows for future expansion to the 1999 Wastewater Facilities Plan Study Area boundary. Operational effort and maintenance is concentrated on a single, central facility. Septic system contributions of nitrogen to the Clark Fork and Bitterroot rivers would be reduced. The effluent discharge would be relocated downstream of the confluence of the Clark Fork and Bitterroot rivers. This alternative avoids current wastewater system constraints induced by the current configuration of the sewer system and existing location of the wastewater treatment plant. Major wastewater pumping would not be required.

A primary disadvantage of the Relocated Treatment alternative is that it would require a new discharge permit (or relocation of existing permit) for effluent discharge to the Clark Fork River, which is a water quality limited, 303(d) listed stream segment, with a total maximum daily load (TMDL). However, the discharge location would be downstream of the confluence of the Bitterroot and Clark Fork rivers, a point better suited to nutrient attenuation than the current discharge. The other significant disadvantage is that a significant, immediate investment in facilities is required to capitalize a completely new treatment plant and interceptor sewer.

A final disadvantage of Alternative E is that it may conflict with the Wastewater Facilities Service Area designation. With this approach, a new wastewater treatment plant and major interceptor sewer would be constructed outside of the proposed Wastewater Facilities Service Area boundary. This action may promote growth in outlying areas, particularly along the interceptor alignment, which is contrary to growth management objectives.

Evaluation Criteria

Five alternatives for wastewater management have been developed. Each alternative differs significantly from the other four, not only technically, but also in terms of how social and political concerns are addressed. To differentiate among the five alternatives, it is necessary to identify key criteria that reflect the community environmental benefits achieved by each alternative. In preparing for evaluation, it is desirable that the criteria differentiate each alternative from the other four.

Working with the Wastewater Advisory Committee, potential criteria for alternative evaluation were identified. A number of the proposed criteria were tested, found to be of questionable value, and were

ultimately rejected. At the process conclusion, criteria determined to be of most benefit included cost, technical feasibility, environmental quality, regulatory compliance, growth management compatibility, compatibility with existing facilities, constructibility, and ease of maintenance. These criteria were judged to distinguish the environmental, technical, and social aspects of each alternative.

Conclusion

The alternative evaluation can be summarized using a ranking process. Alternative A, Existing Service Area, has the lowest present worth cost, however, the rating evaluation reveals that Alternative A does not meet environmental quality and growth management objectives, and does not perform well in terms of technical feasibility, constructibility, and ease of maintenance.

Of the remaining four alternatives, which perform better in terms of meeting environmental quality and growth management objectives, Alternatives B and E generally perform better than Alternatives C and D. However, Alternatives B and E are distinguished from each other based on the significantly greater cost of the Relocated Alternative. Based on cost and the other criteria, Alternative B appears to perform better and is therefore the preferred option.

CHAPTER 8—RECOMMENDED WASTEWATER MANAGEMENT PLAN

A complete wastewater management plan includes collection, treatment, effluent disposal or reuse, and biosolids management. A fifth element is demand management, where the size of wastewater facilities is minimized through the reduction of wastewater flows and loads. A final consideration is sewer extension configuration for new development. Chapter 8 presents a summary of the recommended wastewater management program.

General Description of Recommended Program

In the recommended program, all wastewater will be routed to the central wastewater treatment plant. The existing sewer system and treatment plant will be expanded to provide capacity to accept wastewater from the Wastewater Facilities Service Area. Alternative B Central Treatment is shown conceptually in Figure 1-1.

The recommended alternative achieves economies of scale by building upon the historical investment in facilities by expanding the existing system. It includes extension of sewer service to areas within the City that are currently on septic systems and upgrading the existing plant to advanced treatment for nitrogen and phosphorus control. The alternative also allows for future expansion to the 1999 Wastewater Facilities Plan Study Area boundary. Operation and maintenance efforts are concentrated on a single, central facility. Septic system contributions of nitrogen to the Clark Fork and Bitterroot rivers will be reduced by provision of sewer service and treatment.

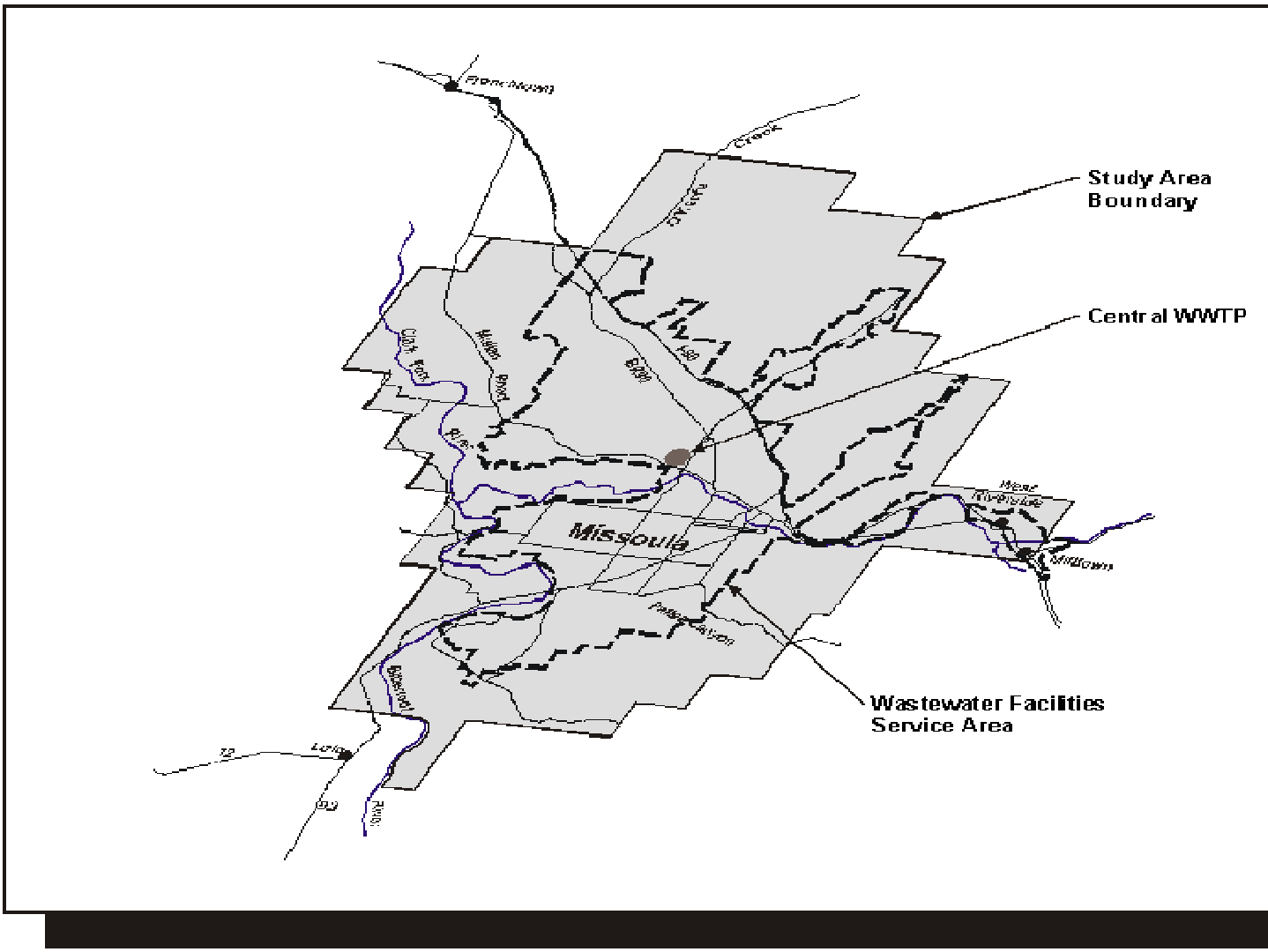

Figure 1-1. Recommended Wastewater Management Plan--Central Treatment

Recommended Capital Improvements

The recommended capital improvements were summarized. The total estimated cost of all capital improvements identified for the 50-year horizon is approximately $134 million. Since Missoula does not have available fiscal resources to immediately finance the improvements, it is necessary assign priority to the improvements. Phased implementation also allows projects to be constructed to meet expanding wastewater service requests. A number of factors were considered in prioritizing the improvements, consisting of: (1) effluent discharge permit compliance; (2) Clark Fork River water quality requirements; (3) groundwater quality protection; (4) growth management; (5) existing system deficiencies; and (6) compatibility with other capital improvement programs.

Wastewater Facilities Service Area

To encourage infill growth within the existing urban area, a core Wastewater Facilities Service Area has been defined. Centralized wastewater service is not intended to be allowed outside this zone, except in extraordinary circumstances subject to special review by the City. The City's contract sewer committee will make any determinations regarding sewer extensions outside the Wastewater Facilities Service Area.

Wastewater Collection and Transmission

Major extensions to the collection system are required to implement the wastewater management plan.

Sewer System Configuration. The recommended wastewater management program does not include significant use of additional STEP systems. Therefore, with the potential exception of localized low-lying areas, the recommended program does not involve the use of STEP systems.

Pumping Stations. Five new major pumping stations will be required for the wastewater management plan.

Renewal and Replacement Projects. Renewal and replacement projects are included in the capital improvement program.

Interceptor Sewers, 20-Year Horizon. Major interceptor sewers are recommended to serve East Missoula, Target Range, Butler Creek, the Airport area, Mullan Road Central, Lower Miller Creek, and Grant Creek.

Interceptor Sewers, 20- to 50-Year Horizon. It is anticipated that as the present Wastewater Service Area approaches saturation, the boundary will be extended outwards. Future interceptor sewers will be required beyond the 20-year horizon to extend wastewater service. In general, these projects extend wastewater service from the initial Wastewater Service Area boundary to the study area boundary.

Phase 1 Wastewater Treatment Plant Upgrade. Under the recommended management program, the wastewater treatment plant will be required to be expanded and upgraded. Biological nutrient removal will be added so compliance with the Voluntary Nutrient Reduction Program may be achieved. Capacity will initially be increased to 10 million gallons per day (mgd).

Future Treatment Plant Upgrade and Expansion. Future phases of plant expansion beyond 10 mgd will require treatment process units be added to the plant throughout both the liquid and solids stream.

Increasing Treatment. Future treatment upgrade beyond baseline biological nutrient removal may be needed for further reduction in phosphorus and nitrogen discharges to the Clark Fork River. Future addition of filtration facilities for effluent polishing is a baseline treatment approach to further phosphorus discharge reduction. Expansion of the activated sludge basins is a baseline approach for further nitrogen reduction.

Effluent Management

The wastewater management program is based upon Alternative B.1, central treatment with biological nutrient removal. This approach achieves the initial desired Clark Fork River instream nutrient targets at the lowest cost. However, biological nutrient removal of increased future wastewater loads may make it difficult to sustain the instream targets, particularly if more restrictive values are established. For this reason, it is recommended that the City explore effluent load diversion approaches.

Effluent Load Diversion. Effluent load diversion is an alternative to higher levels of treatment to meet potentially more restrictive receiving water discharge conditions in the future. Several approaches to diversion of all, or a portion, of the effluent are potentially applicable in Missoula. Load diversion may be accomplished by reclamation and reuse of effluent for application to croplands, constructed wetlands, open space, parklands, or golf courses. The traditional approach to effluent irrigation of croplands requires secondary levels of treatment. Land areas required for the entire plant flow are large, however split stream strategies for seasonal application may be effective in meeting river discharge requirements.

Development of any of these land based effluent reuse options will require an investment in design development. Activities include concept and configuration development, site selection, design and sizing criteria development, preparation of operational plans, and land application permitting. Limited budgets are included as programmatic elements of the wastewater management plan to explore and develop these approaches.

Biosolids Management

The proposed biosolids management plan is to continue contract operations with EKO composting.

Demand Management

Increased quantities of wastewater flow and loading results in larger wastewater facilities. If the flow or loading can be attenuated or reduced, the size, and therefore the cost, of facilities may be reduced. Demand management has the potential to accomplish some degree of flow and loading reduction depending upon existing circumstances. Demand management can be considered in two categories: (1) load reduction programs and (2) load diversion programs.

Load Reduction Programs. A preference was expressed for supporting load reduction programs such as water conservation, infiltration/inflow control, and waste load reduction, rather than load diversion approaches. The installation of water meters is recommended to encourage water conservation, which in turn, reduces wastewater generation. Phosphate detergents have already been banned as a waste load reduction technique. However, the City's industrial wastewater pretreatment program is effective in reducing the discharge of high strength wastes to the sanitary sewer system. As noted in Chapter 5, infiltration and inflow control is recommended as a means to reduce wastewater volume and ensure infrastructure reliability.

Chapter 9—Wastewater Management Plan Implementation

The purpose of Chapter 9 is to develop an implementation plan for the recommended wastewater management program. Key issues include the prioritization of projects, schedule, financing and user charges, and potential outside funding sources. This chapter reviews the driving forces behind the project recommendations and the schedule links with other commitments, which shape the recommendations. Capital improvements are presented in sequence with target implementation dates linked to project summaries presented in Chapter 8 Recommended Wastewater Management Program. Since financing the recommended capital improvements is key, a recommended approach to financial planning and developing updated user charges is presented.

APPENDIX A—Groundwater Quality Evaluation

This appendix presents an evaluation of Missoula Valley groundwater quality. It was found that groundwater quality is significantly degraded by septic wastewater disposal systems. This degradation will increase if additional development is served by on-site disposal systems.

Appendix B—Bitterroot River Nitrogen Loading from On-Site Wastewater Disposal Systems

A significant amount of the nitrogen loading to the Bitterroot River is from septic systems in the Target Range and other Missoula Valley neighborhoods, as documented in this appendix.

Appendix C—Collection System Infiltration and Inflow ANALYSIS

The Missoula wastewater collection and transmission system is subject to infiltration and inflow (I/I). This appendix summarizes the magnitude and sources of I/I.

Appendix D—City Sewer Service Policy

The City policy for sewer service extension is summarized. Annexation is a condition for service extension, however under certain conditions annexation may be deferred.

Appendix E—PRELIMINARY SIZING AND COST ESTIMATES FOR WASTEWATER MANAGEMENT ALTERNATIVES

The cost estimates prepared for each of the five wastewater management alternatives are presented in this appendix.

Appendix F—Communications and Public Involvement Plan

An extensive communications and public involvement program was conducted to support the technical work in this facilities plan. This program is summarized in Appendix F.

Appendix G—Environmental Checklist

An environmental assessment of the proposed wastewater facilities improvements was conducted. The analysis concluded that the proposed project will not have a significant impact on the quality of the human environment.

Appendix H—dischage permit

The City's Montana Pollutant Discharge Elimination System Permit, which was issued October 1, 1998, is included as Appendix H.