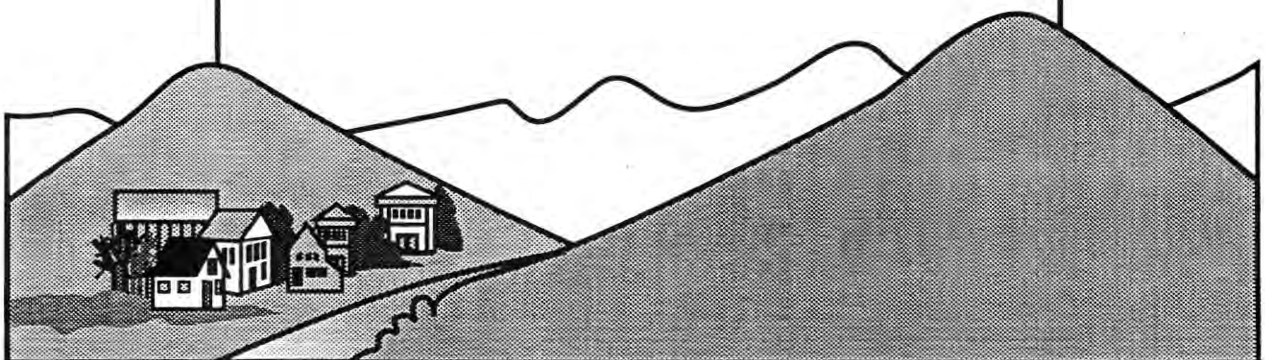
Revised Wastewater Facility Plan



City of Dallas
Oregon

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As part of Task Order No. 11, CH2M HILL has revised relevant design criteria to reflect recent changes in the projected population of Dallas and future elimination of Praegitzer Industries flow to the Dallas WWTP. The purpose of this technical memorandum is to present the most recent population information and summarize the revisions to the design flows and wasteloads.

Summary

Recent population projections for the Dallas UGB indicate that the City of Dallas is expected to grow at a higher rate than that projected in the 1989 Water Study which was the source for the 1996 Facility Plan flow and wasteload projections. Population projections for 2010 and 2020 are 20-24% higher than anticipated, resulting in larger flow and wasteloads generated within the Dallas Urban Growth Boundary (UGB).

Recall that the 1996 Facility Plan flows and wasteloads did not account for the planned phase-out of Praegitzer Industries in 2005. When this phase-out is taken into consideration, the 2010 and 2020 flows and wasteloads decrease to levels that compare closely with the 1996 Facility Plan values. Therefore, no significant modifications to the facility plan recommendations is required.

Population Projection

The Center for Population Research and Census at Portland State University has prepared a report of projected population for the years 1995 to 2020 in 5-year increments. A summary of the projected population within the UGB is presented below in 5 year increments along with the initial population projections from the 1989 Water Study for comparison.

Total Population inside UGB		
Year	1989 Water Study	1996 CPRC Report
1995	11,097	11,639
2000	11,523	13,117
2005	12,367	14,593
2010	13,287	16,072
2015	14,288	17,548
2020	15,377	19,043

Design Flows and Wasteloads

Based on revised population information and the planned phase-out of Praegitzer Industries in 2005, CH2M HILL recommends revising the design flows and wasteloads to the following values.

Parameter	Facility Plan Value	Revised Value
Year 2010		
Population	13,287	16,072
DWADF	2	2.2
DWMMADF	2.73	3.0
WWADF	4.01	4.2
WWMMADF	6.77	7.0
WWPIF	15.39	15.7
DWACBOD	2504	2795
DWMMCBOD	3152	3411
WWACBOD	2712	2885
WWMMCBOD	3719	3855
DWATSS	2576	2869
DWMMTSS	2962	3214
WWATSS	3282	3469
WWMMTSS	4241	4381
Year 2020		
Population	15,377	19,043
DWADF	2.35	2.7
DWMMADF	3.07	3.4
WWADF	4.64	5.0
WWMMADF	7.39	7.7
WWPIF	16.13	16.6
DWACBOD	2932	3345
DWMMCBOD	3691	4088
WWACBOD	3175	3388
WWMMCBOD	4355	4568
DWATSS	3016	3434
DWMMTSS	3468	3832
WWATSS	3843	4090
WWMMTSS	4965	5211

These projections assume that Praegitzer Industries will not be contributing to the WWTP influent flows or loadings after 2005 and all industrial CBOD and TSS loadings remain constant at 150 mg/l and 154 mg/l, respectively. In addition, industrial flows are assumed to grow at the same rate as the UGB population.

Tables 3-3 and 3-5 from the 1996 Facility Plan have been updated and are included as attachments to this memorandum.

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Executive Summary

EXECUTIVE SUMMARY

Chapter 1: Introduction

This Revised Wastewater Facility Plan for the City of Dallas Wastewater Facility has been prepared as the final planning step to define the wastewater system improvements necessary for the City to comply with new water quality standards, to upgrade and replace 25-year old facilities, and to provide for future planned growth. The City has entered into an agreement with the Oregon Department of Environmental Quality (DEQ) to implement improvements to meet the new state and federal water quality criteria. This facility plan, which outlines a plan for meeting the new requirements, satisfies the first step in the City's agreement with DEQ.

The City's overall goal for this plan is the development of a wastewater improvement program that maximizes the environmental benefits to the Rickreall Creek planning basin for the capital invested. Achieving this goal has been challenging and the plan has required that a balance be struck between the environmental, regulatory, and cost issues and concerns associated with this project.

A previous August 1994 plan, along with an environmental assessment, was originally submitted to DEQ. The August 1994 plan proposed construction of treatment plant improvements and a pipeline for discharge to the Willamette River. At the public hearing held to review the plan, significant issues regarding impacts to beneficial uses were raised. Subsequent to the public hearing, the Oregon Department of Fish and Wildlife concluded that the lower reach of Rickreall Creek from the WWTF to the confluence with the Willamette River should be reclassified as nonsalmonid (supports fish passage). The August 1994 plan was based on the salmonid (fish spawning) classification that has more stringent water quality criteria. In addition, the water quality regulations were in the process of being amended as part of the triennial review process.

Because of these circumstances, DEQ provided the City the option to revise the facility plan to address the beneficial use concerns and to account for the changes in stream classification and subsequent regulatory amendments. This revised plan has therefore been developed to respond to these issues and to develop a plan that provides an affordable solution with the greatest overall benefits to the Rickreall Creek planning basin.

Chapter 2: Existing Conditions

This chapter summarizes the existing conditions of the study area and wastewater facilities, including information on the existing wastewater flows and characteristics. The study area for this project is the current urban growth boundary of the City of Dallas, which is assumed to remain unchanged during the facility planning period of 1995 to 2020.

The City's wastewater system consists of nearly 40 miles of sewer pipe and the wastewater treatment facility, located about 2 miles east of Dallas. The plant has been in operation since 1969. The existing plant has served the City very well and continues to produce effluent quality that meets its original design criteria. However, the facility is nearly 25 years old and the regulations have changed.

The current average dry weather flow to the plant is about 1.6 mgd and the average wet weather flow is about 3.4 mgd. During the year, flows are typically at a minimum in September and peak in February. Peak instantaneous flows during winter storm events exceed the 6 mgd maximum capacity of the plant, resulting in bypasses of untreated sewage. The wastewater strength is generally lower than typical domestic sewage. The low waste strength is consistent with a collection system that is affected by seasonal rain induced flows.

The deficiencies of the existing system are outlined in this chapter and they have been categorized into four groups: water quality issues, process equipment, controls, and building codes and safety. Of these, the water quality issues are the most significant area of concern. Because of the change in regulations to water quality based standards, the effluent from the facility results in seasonal nonconformance with the water quality criteria. The plant experiences occasional bypasses of untreated sewage during the wet weather season as a result of severe rain events. In addition, inadequate reliability, poor outfall mixing, less than 85 percent treatment efficiency during wet weather high flow conditions, and effluent toxicity from chlorine have been noted as other concerns.

Chapter 3: Future Conditions

The projected population, wastewater flows, and wastewater characteristics are summarized in this chapter. The planning period for which the projections were made was 25 years, from 1995 to 2020.

The current population in Dallas as of 1992 is approximately 10,000. Growth in Dallas since about 1980 has been at a slow but steady pace. The projected growth for this study was taken from the City's 1989 Water Study. That study projected the growth to continue at a steady rate through the remainder of the planning period. From the projections, the anticipated service population in the year 2020 is about 15,400.

The existing and projected wastewater flows generated from this population base were broken down into base wastewater (from residential, commercial, and industrial sources), groundwater infiltration, and rain-induced infiltration and inflow. The projected dry weather sewage flows were calculated based on the population projections and the historical per capita base wastewater flow of 117 gallons per day. It was assumed this base per capita wastewater flow would remain the same over the planning period. The historic wastewater strength is lower than typical domestic sewage, although the trend over the last five years has shown an increasing trend in waste strength. This trend may continue as the City pursues further reductions in rain-induced infiltration and inflow. The projections of waste strength for carbonaceous biochemical oxygen demand (CBOD) and total suspended solids (TSS) were based on the most current plant operating data for 1994/1995. Because of limited nutrient data, typical literature values for nutrients were used to project the nutrient waste loads. No allowance for a new high-strength industrial discharge was included in the projections.

Chapter 4: Rickreall Creek Water Quality and Toxicity Analysis

Rickreall Creek is a tributary of the Willamette River. The water quality criteria are therefore determined based on the Willamette Basin standards. Based on the original classification as a salmonid producing stream, Rickreall Creek has been identified as a water quality limited stream, which means that at certain times the stream quality violates the state's standards. However, subsequent to the August 1994 Wastewater Facility Plan, the DEQ and ODFW concluded that the stretch of Rickreall Creek from the existing wastewater treatment facility (WWTF) outfall to the Willamette River should be reclassified as a "cool water"(i.e. non-salmonid producing) under the new regulations (Amendments to OAR 340-41) that were adopted in January 1996. As a result of this reclassification and related regulatory changes, the City chose to re-evaluate the potential for continued discharge to Rickreall Creek.

As part of the updated analysis, supplemental in-stream sampling and testing was conducted to evaluate the stream water quality and the impact from the Dallas discharge. The additional water quality data, while not representative of an exhaustive data base, provided an improved basis for performing the water quality modeling and toxicity analyses. The stream modeling was performed using the model QUAL2E, while metals toxicity modeling was performed using a spreadsheet developed by EPA.

The water quality stream model was used to evaluate the effects of various treatment performance levels on the stream and to determine if water quality criteria/guidelines could be achieved. The effects of seasonal changes in stream quality and effluent quality were also considered in the modeling effort by evaluating seven different seasonal conditions. The water quality criteria/guidelines considered in the model analysis included dissolved oxygen, chlorophyll-a, temperature, total dissolved solids, and turbidity. A brief discussion of each follows:

- **Dissolved oxygen:** The modeling showed that the new dissolved oxygen criteria for cool water could be achieved under all seasonal conditions and treatment alternatives considered.
- **Chlorophyll-a:** In-stream values for chlorophyll-a were concluded to be within the target levels established.
- **Temperature:** For temperature, the model revealed that without the WWTF's discharge, the rise in the creek's temperature in the downstream reach was greater during the summer months of July through September than if the effluent was discharged. This finding resulted in the conclusion that, regarding summer stream temperature, it was more beneficial to keep the effluent in the stream than to remove it.
- **Total dissolved solids:** In-stream values for TDS were found to exceed the guideline both above and below the WWTF discharge. However, the TDS levels expected are not anticipated to result in impairment of beneficial uses.
- **Turbidity:** Based on the comparative values for turbidity of the stream and the WWTF effluent, no discernible change in turbidity is anticipated.

Other water quality criteria considered included pH, bacteria, and toxicity.

- **pH:** In-stream values for pH are expected to meet the criteria.
- **Bacteria:** The effluent limits for bacteria will be achieved; however, because of other nonpoint source contamination sources, the in-stream water quality may sometimes exceed the in-stream criteria.
- **Toxicity:** The toxicity analysis performed showed that except with the highest level of treatment considered, discharge to the creek would not be feasible during most flow conditions for combined domestic and industrial flows. Because of this conclusion, an alternative was developed to consider separation of industrial flows from domestic flows. Analysis for the domestic waste characteristics found that discharge to the stream was possible under many seasonal conditions to conform to toxicity criteria, depending on the treatment level. With treatment levels at or above advanced biological plus filtration, year-round discharge may be possible to meet toxicity criteria, although verification testing is recommended.

Based on the modeling analysis, proposed flow-based mass loads for discharge to Rickreall Creek were developed that provide conformance with water quality standards. Because these mass loads are a change from the current mass loads, action for approval will be required by the Environmental Quality Commission. The mass loads include separate conditions for winter and summer and also include different mass limits for two stream flow conditions for both winter and summer. A significant change in the mass loads from the present limits is the inclusion of a mass load limit for ammonia.

Chapter 5: Infiltration/Inflow Evaluation

Wastewater collection systems, although designed to convey sewage, also convey a certain amount of infiltration and inflow that originates from groundwater, rainfall, and snow melt sources. Part of the planning process included evaluating the existing collection system to determine to what extent infiltration and inflow contribute to the total flow. Field flow monitoring was conducted to provide data on the actual sewer flows during rain events and the total flows in the system under peak conditions. The collection system was divided into 10 subbasins and each basin was monitored separately.

After the field data were collected, the data were used to evaluate and predict the peak flows from each basin and to estimate the contribution of infiltration and inflow to the total flow. This information was then used in a cost analysis to determine what portion of the infiltration and inflow could be removed cost-effectively. From this analysis it was concluded that in five of the 10 subbasins it was cost-effective to remove a portion of the flow contributed by infiltration and inflow. The potential reduction at the design storm peak instantaneous total flow was estimated to be 2.8 mgd (17.1 mgd to 14.3 mgd), if the levels of removal indicated are achieved. The estimated cost to achieve the projected level of removal is $3.5 million.

The flow data and subsequent investigation led to the conclusion that surcharging occurs in the La Creole interceptor during high flows. Occasional bypasses of untreated sewage occur during these high flows primarily at the WWTF because of limited pumping and treatment capacity. The analysis indicates that a second interceptor as planned in the 1971 study will be needed to convey the sewage to the treatment plant. The Ash Creek interceptor proposed in that study is recommended as part of the overall improvement program.

Chapter 6: Water Quality and Regulatory Standards and Criteria

The existing and proposed regulations, standards, and design criteria are summarized in this chapter. Criteria that are summarized include the USEPA Secondary Treatment Regulation, the Willamette Basin water quality standards, Rickreall Creek and Willamette River discharge criteria, reuse criteria for land application of effluent and sludge, and Environmental Protection Agency (EPA) reliability and redundancy criteria. In addition, the proposed regulatory changes considered and recently adopted as part of the triennial review are presented.

The USEPA Secondary Treatment Regulation, described in 40 CFR, Part 133 of the Federal Code, is summarized. Secondary treatment is defined in terms of effluent biochemical oxygen demand (BOD), effluent total suspended solids (TSS), and the removal efficiency of both BOD and TSS.

The Willamette Basin standards, which are established by DEQ and described in the Oregon Administrative Rules 340-41-445, are summarized. Water quality parameters such as dissolved oxygen, temperature, turbidity, pH, and bacteria are some of the criteria considered. From these basin standards and the modeling described in the Rickreall Creek Water Quality Analysis (Chapter 4), the discharge criteria for Rickreall Creek were established. In addition, DEQ performed modeling of a proposed Willamette outfall location downstream of the confluence with Rickreall Creek. From this modeling, discharge criteria for the alternative Willamette River discharge were established.

An alternative to direct discharge to surface waters is the use of effluent to meet irrigation demands of agricultural lands during the dry weather periods. The goal of this approach is to beneficially use the effluent by applying at rates that meet the crop's irrigation and nutrient demands. The rates for various crops are established in this chapter. Also included are criteria such as seasonal limitations, storage requirements, and treatment and monitoring requirements.

Stabilized sludge (biosolids) may also be beneficially reused by applying the sludge to agricultural lands. Application of sludge to land is regulated under the Code of Federal Regulations 40 CFR Part 503, which were recently adopted. The state has recently adopted the federal regulations. The application of sludge to land depends on the nutrient value of the sludge, as well as the metals content, which is limited by the regulations. Other important considerations include site access, crop selection, site life, seasonal constraints, and site monitoring and reporting. These elements are described in the chapter.

Other key criteria in the development of a wastewater treatment facility are the reliability and redundancy requirements established by EPA. These requirements set minimum standards for mechanical, electrical, fluid systems, and component reliability. The criteria are established to ensure that receiving waters are not unacceptably degraded and that satisfactory operation is maintained during power failures, flooding, peak loads, equipment failures, and maintenance shutdowns. The class of reliability is dependent on the type of receiving stream and its use. It is anticipated that for Rickreall Creek, Class II reliability will be acceptable, while for the Willamette River discharge alternative, Class I reliability will be needed.

Chapter 7: Wastewater Treatment, Storage, and Effluent Disposal Options

This chapter summarizes the analysis of options for wastewater treatment, storage, and disposal options. The analysis included an initial alternatives screening step that was used to select viable options for further study. In this screening step, potential effluent disposal options such as surface discharge, and agricultural irrigation were considered. Various treatment systems and processes are discussed and summarized for these disposal alternatives. The disposal and associated treatment systems that were found to be viable during the screening evaluation were then further analyzed.

Four combinations of disposal alternatives and treatment technologies were subjected to the detailed analysis. These alternatives include wet weather storage combined with summer irrigation, discharge to Rickreall Creek combined with summer irrigation(also includes separate industrial effluent irrigation), Willamette River discharge with demand-based summer irrigation, and year-round discharge to Rickreall Creek using best available treatment technologies. The analysis of these alternatives included the development of design criteria information and preliminary process sizing. This information was then used to prepare a capital and operations and maintenance cost analysis.

The cost analysis included the development of present worth costs for each alternative. The results of this analysis showed that the Willamette River discharge with demand irrigation (see Table 7-11) was the least-cost net present worth option at $22.0 million. The second lowest present worth cost alternative was Rickreall Creek discharge with summer irrigation at $23.2 million. Given the order of magnitude of the costs and the relative closeness (within about 5 percent), these alternatives are considered equal on a cost basis. The winter storage and summer irrigation option and the year-round Rickreall discharge options were nearly 2 and 2-1/2 times more expensive than the lowest cost option, respectively.

In addition to the cost evaluation, a noncost analysis was performed to consider the overall technical feasibility and environmental effects/benefits of the four system options. The technical analysis considered such things as reliability, ease of implementation, performance, and future regulatory compliance. Environmental issues considered included land use, cultural and historic resources, fisheries, and other natural resources. The positive and negative aspects of each alternative are discussed and summarized.

The review of technical issues found that the winter storage and summer irrigation and the Rickreall Creek discharge with summer irrigation options provide an equal level of technical merit. The least desirable alternative technically was the year-round Rickreall discharge option using the best available technologies. The environmental issues review indicated that the year-round Rickreall discharge option would provide the most environmentally sound solution. The remaining three system options all resulted in similar scores for environmental issues. A general conclusion reached during the environmental analysis was that the alternatives that provided continued discharge to the creek appear to result in the most environmental benefits and least negative impacts to the Rickreall Creek basin as a whole. Therefore, based on the cost and noncost evaluations, it was concluded that the Rickreall Creek discharge with summer irrigation system option (which attempts to maximize continued discharge to Rickreall Creek for the majority of the year while complying with water quality standards) was the best overall approach for wastewater treatment and disposal for the City of Dallas.

Chapter 8: Sludge Stabilization and Disposal Options

Similar to the wastewater treatment and disposal alternatives evaluation, an evaluation of sludge stabilization and disposal alternatives was conducted. The evaluation began with a screening step to consider the viability of various stabilization and disposal options. From the screening process, four stabilization alternatives were selected for further evaluation. To provide the greatest flexibility for the facility in the future, it was concluded that each of the stabilization alternatives would be capable of producing sludge that could either be land applied for beneficial use or disposed in a landfill.

The four stabilization alternatives considered were: existing aerobic digestion with thickening and humus pond modifications; existing aerobic digestion and humus ponds with mudcat sludge removal followed by lime stabilization and dewatering; new, high-temperature aerobic digestion with liquid storage and dewatering; and aerated sludge storage with dewatering and lime stabilization. Design criteria and preliminary process sizing were developed for each of the alternatives. From this information, capital and operation and maintenance costs were developed. Net present worth costs (see Table 8-11) were also determined and the results indicated that the aerated storage with dewatering and lime stabilization alternative was the least-cost option at $3.8 million.

A noncost evaluation was performed that considered issues similar to those in the wastewater treatment evaluation. This analysis concluded that the least-cost alternative for sludge stabilization also presented the greatest environmental benefits and least negative impacts on a noncost basis. Therefore, the recommended sludge stabilization approach for the City of Dallas WWTF is aerated storage with dewatering and lime stabilization.

Chapter 9: Wastewater Management Program Optimization and Summary

This chapter provides a summary of further optimization of the recommended alternative, components of the recommended improvements, estimated program costs, mitigation measures to address noncost issues, and implementation of the program improvements.

Program Optimization

To provide the most efficient use of the existing facilities and the least-cost treatment system for the recommended disposal option, a more detailed evaluation of possible combinations of treatment level and effluent disposal approaches was conducted. The analysis considered four treatment sub-options for the preferred system option of Rickreall Creek discharge with summer irrigation: advanced biological treatment without filtration, advanced biological with filtration, advanced biological with chemical treatment and filtration, and conventional biological with wetlands polishing. Depending on the treatment level and anticipated effluent quality for each sub-option, the duration of discharge to Rickreall Creek varied from about 4 months to 12 months. All of the sub-options assumed separate industrial effluent poplar tree irrigation.

The analysis of these sub-options included the development of design criteria information and preliminary process sizing. This information was then used to prepare a capital and operations and maintenance cost analysis. The comparison of the four sub-options on a net present worth basis revealed that the advanced biological treatment with filtration sub-option was the least cost with a value of $23.2 million. However, two other options, including the advanced biological treatment without filtration and the advanced biological with chemical treatment and filtration, were within 10 percent of the lowest cost alternative. Therefore, any one of these three sub-options could be chosen on a cost basis.

From an environmental benefits perspective, the option that maximizes the effluent discharge to Rickreall Creek provides the greatest overall benefit to the planning basin. Because of the limited data for metals, the ability to reduce metal waste sources, and the assumptions made regarding metals removal, it is not possible to determine at this time whether metals toxicity criteria will be achieved without the addition of poplar irrigation or other alternatives. Therefore, the recommended plan consists of phased implementation of the improvements combined with testing to verify regulatory compliance. This approach prevents investment in capital improvements that may later be found unnecessary. In summary, the plan is comprised of the following components:

- Collection system improvements
- Treatment facility improvements
- Separate industrial effluent irrigation
- Testing to establish design criteria and to verify waste characteristics and treatment performance
- If metal toxicity criteria are not achieved, then add supplemental facilities to address the metal toxicity issues (poplar irrigation, chemical treatment, or flow augmentation)

Program Summary

The overall system recommendations for the City of Dallas include collection system improvements, wastewater treatment and disposal improvements, and sludge stabilization and disposal improvements. The collection system improvements include two key elements: new interceptors, and source reduction. The construction of the proposed Ash Creek interceptor and other interceptor improvements budgeted as part of the facility plan improvements are estimated to cost $1.9 million. For source reduction of infiltration and inflow, it is recommended that approximately $3.7 million be spent on sewer system correction over the next 12 years.

The treatment and disposal improvements include the upgrade and expansion of the existing wastewater treatment facility and construction of an outfall for discharge to Rickreall Creek. The improvements would also include construction of a separate storage and poplar tree irrigation system for industrial effluent. Pilot testing early in the project will establish design criteria and verify feasibility of the separate industrial irrigation system. The proposed liquid treatment facility will include screening, advanced biological treatment, filtration, disinfection, dechlorination, post aeration, and other ancillary facilities. The projected capital cost of the liquids treatment facilities and the liquid disposal facilities is estimated to be $12.4 million and $3.1 million, respectively.

The sludge stabilization and disposal improvements consist of maintaining the existing aerobic digester for sludge storage, upgrading the existing humus ponds with an asphalt liner, and adding a dewatering and lime stabilization facility. The projected capital cost of the sludge stabilization and disposal improvements is $2.0 million.

The overall program capital costs will include the collection system, wastewater treatment and disposal for liquids and sludge, and engineering and administration costs. Including all of these components, the projected capital investment for the City of Dallas is $26.6 million in 1995 dollars. The overall program capital costs are summarized in Table E-1. In addition to the capital expenditures, the City will need to plan for the operation and maintenance cost of the facilities. The estimated annual operating cost for the collection, wastewater treatment and disposal, and sludge stabilization and disposal facilities is approximately $880,000 annually (excluding City administration and engineering costs).

Table E-1
Program Capital Cost Summary

Recommended Improvements	Estimated Capital Cost (1995 $, Millions)
Collection System Improvements	
New Interceptors	$1.9
Source Reduction (Infiltration and Inflow)	3.7
Treatment System Improvements	
Liquids Treatment	12.4
Liquids Disposal	3.1
Sludge Treatment and Disposal	2.0
Engineering, Legal, and Administration	3.5
Total Capital Cost	$26.6

If, after the components summarized in Table E-1 are implemented, the WWTF effluent irrigation system is found to be necessary to maintain water quality standards compliance, then the total program cost could increase to approximately $31.5 million in 1995 dollars. In addition, the O&M cost could increase to $960,000 annually.

The overall environmental benefits of the recommended plan, which keeps the effluent in Rickreall Creek, are considered greater than those for the other options, which result in removing the effluent from Rickreall Creek. Conversely, the environmental impacts associated with the recommended plan are considered less than those for the other alternatives evaluated. The identified short- and long-term environmental impacts that will result from the construction and that will require mitigation are discussed in this chapter. Further field studies to evaluate these impacts may also be necessary.

The implementation of the recommended improvements will begin after final approval of this facility plan. The implementation steps include the design, bid, and construction of the proposed facilities. Another important element of the implementation will include the acquisition of financing for the project. The anticipated duration of the initial improvements is 42 months from the time this facility plan is approved. Based on the periods included in the schedule for DEQ review and approval of the facility plan and for the design documents to be prepared, the Dallas Wastewater Treatment Facility is expected to be operational by fall of 1999. Because of a need to establish detailed design criteria for separate industrial poplar irrigation and to collect supplemental metals data, elements of the recommended plan should be implemented in a specific sequence as described in this chapter.

Chapter 10: Facility Financial Plan, Implementation, and Recommendations

The City's ability to implement the wastewater management program is dependent on its ability to generate sufficient revenue from the operation of the system and to secure long-term financing. This chapter discusses available City resources, options for financing, affordability criteria, and alternative phased project deliveries.

The primary resource available for wastewater improvements is revenue generated through rates and charges. The current rates for the City are summarized in Table 10-1. The current single family minimum charge for wastewater service is $27, up from $17 in 1993. Because of the anticipated improvements required, the City has undertaken a program to increase the rates. The City projected a 30 percent per year increase beginning in 1994 that would be implemented over 4 years.

Other resources for supporting the improvement program include grants and loans. Several grant programs exist, although each has specific eligibility requirements and criteria. At this time, the City anticipates that only a small portion of the costs of the program will be funded through grants. The City intends to pursue the maximum possible Community Development Block Grant of $750,000 for public works projects. Loans therefore present a more likely method for funding the improvements. Possible loan programs include State Revolving Fund (SRF), City-issued bonds (revenue and general obligation bonds), state borrowing programs, and Farmers Home Administration (FHA) loans. The City's preferred method of financing the wastewater program is through the use of the SRF program and City-issued revenue bonds, although an FHA loan/grant combination may provide an alternate approach. Because of the uncertainties associated with voter approval, general obligation bonds are not viewed as being a reliable or realistic financing mechanism.

The City's capacity to obtain the various financing options is presented in this chapter. The maximum SRF loan amount possible is approximately $14.4 million. The total available funds from other sources are estimated to be about $3.8 million. A summary of the financing capacity presented in Table 10-7 indicates that, given the maximum available funds, the City faces a shortfall of about $11.8 million if the proposed comprehensive program is immediately implemented.

To generate the funds necessary to immediately implement the entire program, the monthly single family rate would need to increase to over $50 by 1998. According to EPA, the maximum affordable rate for wastewater service is 1.5 percent of the median household income. For the City of Dallas, this affordability criteria equates to a maximum monthly rate of approximately $40 in 1998. Based on the EPA affordability guideline, the immediate implementation of the proposed program is not affordable.

Because immediate implementation of the comprehensive program is not affordable, an alternative implementation approach was developed. The alternative implementation approach considers phasing of the improvements that are recommended. In developing the alternative implementation approach, the aim was to achieve as many of the project goals as possible, giving priority to those goals that significantly affect water quality. High-priority issues included eliminating untreated sewage bypasses and meeting water quality criteria. The preferred approach considers phased implementation of the plan of $26.6 million that excludes the WWTF effluent irrigation system. This approach anticipates that with separation of industrial effluent and the addition of filters, the metal toxicity criteria will be met. Supplemental testing performed after the improvements are implemented will verify the performance. If it is found that the metal toxicity criteria are not achieved, the City will evaluate adding supplemental improvements to meet the criteria. Supplemental options that the City could consider include flow augmentation, chemical treatment, or poplar tree irrigation. If the poplar irrigation system was added, the cost of the overall program could increase to $31.5 million.

The preferred approach includes a three-phased implementation of the improvements. The first phase would include the advanced biological treatment system and collection system improvements to minimize untreated sewage bypasses and meet key water quality criteria. Phase 2 would include development of the separate industrial effluent irrigation system to address metals toxicity issues. The third phase would include the addition of filtration to consistently effect additional metals removal, achieve the 85 percent removal efficiency requirement up to the DWMMADF flow, and provide for future growth. Also, implementation of facilities to provide flexibility for land application of sludge would be implemented in the third phase. The need for adding supplemental facilities to achieve metals criteria will be determined through testing and analysis following implementation of Phases 1 and 2.

The phased implementation approach allows the City to manage its resources so that sufficient financing can be obtained to support the program. However, if the supplemental facilities needed to meet metal toxicity criteria are ultimately required, it appears that other funds (possibly general obligation bonds) will be needed to fund a portion of the program. The preferred approach results in the monthly single family sewer rate approaching the EPA affordability index of 1.5 percent of median household income. An estimated monthly residential rate of about $48 would result in the year 2008, when the third phase would be operational.

Chapter 11: Public Participation

The development of this facility plan included a public participation program to provide information on the development of the plan and to receive public input on the recommended solutions. The program included the participation of a Citizens Advisory Committee, which served as a liaison between the public and other participants in the development of the plan. Other public participation activities included the issuance of newsletters to all sewer customers, and public meetings. Comments received through the newsletters and public meetings were used to develop the solutions and shape future planning within the Rickreall Creek basin.

Chapter 1
Introduction

CHAPTER 1

INTRODUCTION

This Wastewater Facility Plan has been prepared as the final step in the planning process to define the wastewater system improvements necessary for the City of Dallas to comply with new water quality standards for Rickreall Creek, to upgrade and replace 25-year-old facilities, and to provide the capacity to serve future planned growth. The Facility Plan evaluates the City's existing sewage collection and treatment facilities, identifies existing system deficiencies, summarizes water quality criteria, and evaluates feasible alternatives to upgrade and expand the City's sewerage facilities to meet these needs.

The City's overall goal for this plan was to develop a wastewater improvement program that maximizes the environmental benefits to the planning basin for the dollars invested. Achieving this goal will be difficult and will require that a balance be struck between the environmental, regulatory, and cost issues and concerns involved in a project where the recommendations can have significant implications to the basin.

Two regulatory issues have prompted the City of Dallas to prepare this Wastewater Facility Plan; nonconformance with new state and federal water quality criteria, and wet weather bypassing, which is in violation of federal minimum secondary treatment standards (40 CFR, Part 133).

In implementing compliance with water quality initiatives, DEQ is addressing these issues for each city as their permits come up for review. In August 1989, the City's NPDES Waste Discharge Permit expired and the process of renewing that permit to meet the water quality initiatives began. DEQ initiated water quality studies on Rickreall Creek to evaluate the impacts from the City's discharge and to identify waste load allocations for the discharge. On December 19, 1991, the City received a Notice of Noncompliance from DEQ that Rickreall Creek would be placed on the Federal Register as a water quality limited stream during the summer months because of high coliform bacteria and nutrients.

Because it is unlikely that the City could meet a revised permit based on the water quality criteria until improvements are made, the DEQ and the City entered into an agreement that defines interim standards and a schedule for compliance. A key element of this schedule is to prepare and submit a Wastewater Facility Plan that recommends improvements to the existing facilities that will meet the new permit. As indicated in the Agreement, part of the facility planning effort is to include the development of water quality criteria for Rickreall Creek, which includes defining the waste load allocations for the City of Dallas.

In addition to the need for water quality compliance, the City faces the problem of aging wastewater collection and treatment facilities. Some of the City's sewer lines are more than 40 years old and do not have the capacity to handle current and projected flows. In addition, the City's underground pipe system has deteriorated through the years and unwanted groundwater and rainwater enter the pipes through cracks, bad joints, and undesirable connections such as catch basins and roof drains. These conditions combine to cause periodic wet weather overflows, which result in untreated wastewater and stormwater bypassing treatment and directly entering local surface waters, thus affecting public and environmental health.

The City has proceeded with the completion of this Wastewater Facility Plan to meet the requirements of the agreement between DEQ and the City. The facility planning effort included:

- Definition of the City's existing and future sewer service area and projection of future service populations, flows, and loads.
- Analysis of the City's existing sewage collection facilities and the development of capital improvements needed to correct existing deficiencies and expand the system to accommodate future growth.
- Analysis of water quality criteria for Rickreall Creek and development of proposed mass load limits for the City of Dallas.
- Detailed analysis of the most viable treatment and disposal alternatives identified, and selection of the best alternative(s) for further evaluation.
- Development of a preliminary financing strategy to fund the required capital improvements and operating costs, including an assessment of the effects on City financial operations and user costs.

From this plan, the City will select a recommended plan that fully satisfies the needs and objectives in the most cost-effective, environmentally sound manner.

Facility Plan Organization

The City of Dallas Wastewater Facility Plan is comprised of chapters and appendixes. The chapters summarize the facility planning process and results. The appendixes include technical information supportive of the main report.

This document contains core information about the study and is organized into chapters that present specific elements of the study. Tables and figures immediately follow the page on which the first reference appears.

Contributing Documents

Many reports, studies, and technical reference documents supported the completion of this Facility Plan. Major contributing reports included:

- Sanitary Sewer Plan for The Dallas Urbanizing Area, CH2M HILL, October 1970
- Wastewater Facility Plan, City of Dallas, CH2M HILL, May 1980
- Sewer System Evaluation Survey, Dallas, Oregon, CH2M HILL, February 1981
- Comprehensive Plan, City of Dallas, Oregon, December 1987
- Final Wastewater Facility Plan, City of Dallas, Oregon, August 1994

Acknowledgments

This Facility Plan was completed with input and cooperation from numerous individuals and groups, including: Polk County; the Soil Conservation Service; Rickreall Creek Irrigation District; Oregon State University (OSU); OSU Farm Extension Service; and the Oregon Department of Environmental Quality. Valuable assistance was also provided by City staff and the Citizens Advisory Committee (CAC), and the input received from the citizens of Dallas, Oregon.

In addition, the City acquired the services of Regional Financial Advisors, Inc., to develop the financial plan presented in the document.

We appreciate the courtesy and assistance received from the individuals who contributed information, advice, and support during the preparation of this Wastewater Facility Plan.

Facility Plan Revision

This plan, along with its associated Environmental Assessment, was originally submitted to DEQ in August of 1994 for review and approval. During the agency and public review process, significant issues were raised regarding the impacts of the proposed recommended improvements on Rickreall Creek. Specifically, questions were raised about what impacts would result from the removal of the Dallas WWTF effluent from Rickreall Creek.

In addition to these issues, after further review the Oregon Department of Fish and Wildlife (ODFW) modified their previous position that Rickreall Creek downstream of the Dallas WWTF should be classified as salmonid producing water. ODFW's position now indicates that Rickreall Creek downstream of the Dallas WWTF should be classified as non-salmonid producing, although fish passage would still occur in this stretch. This reclassification results in a change in the water quality criteria for dissolved oxygen and temperature for discharge to Rickreall Creek.

Other new developments affecting the Plan include revisions in the water quality criteria as part of the DEQ triennial review that were adopted in January 1996, and the proposed new regulations regarding alternative mixing zone definitions for effluent dominated streams. In addition to the recently adopted changes and proposed new regulations, there appears to be a significant change in philosophy within both the regulatory and public sectors from point source control to a basinwide management approach. This new basinwide philosophy is founded on the principal that the best overall solution is the one that provides the greatest overall benefits to the basin as opposed to the one that may meet all of the given criteria or standards.

Because of the opposition to the recommended plan, the changes in water quality criteria, the proposed new regulations regarding mixing zones for effluent dominated streams, and the new basinwide management philosophy, the City of Dallas has chosen to revise this plan to address the comments and account for the changes in water quality criteria.

Chapter 2
Existing Conditions

CHAPTER 2

EXISTING CONDITIONS

Introduction

This chapter discusses the existing conditions of the study area and wastewater facilities. Included in this chapter are sections discussing study area characteristics, existing wastewater facilities and operations, existing wastewater flows and characteristics, effluent biomonitoring study results, and existing facility deficiencies.

Study Area Characteristics

Study Area Definition

The study area for this facility plan is the present land and present and future population within the urban growth boundary (UGB) for the City of Dallas. It is assumed that the UGB area will remain constant during the planning period of 1995 to 2020. It is also assumed that the existing and future population served by the wastewater collection and treatment systems is equal to the population served by the City's water supply system. Figure 2-1 is a map that shows the current UGB.

Topography

The City of Dallas is located in the Rickreall Creek drainage basin in northwestern Oregon. Rickreall Creek bisects the City as it flows from west to east. The City lies on the west side of the Willamette Valley against the foothills of the Coast Range, which runs north and south. Most of the City's topography is relatively flat, with northwestern and southwestern outlying areas becoming hilly toward the Coast Range.

Soils

Soil characteristics are grouped into the following eight broad categories based on depth, texture, wetness, slope, erosional hazard, overflow hazard, permeability, structure, water holding capacity, inherent fertility, and climatic conditions as they influence the use and management of land:

Class I—land has few limitations.

Class II, III, and IV—land requires more careful conservation efforts due to higher erosion or slide hazards, or drainage problems.

Class V, VI, VII—lands are generally restricted to grazing and urban development.

Class VIII—land is unsuitable for most agricultural, forestry, and urban uses and is used primarily for wildlife habitat and watersheds.

The 1980 Wastewater Facility Plan determined that approximately 80 percent of the soil in the planning area (which has not changed significantly) is Class II, 10 percent is Class IV, 5 percent is Class III, and 5 percent is other. Soils are rated by the USDA Soil Conservation Service (SCS) as having either slight, moderate, or severe limitations. "Slight" indicates no special planning or designing is required in development; "moderate" indicates development requires careful planning and design; and "severe" indicates the proposed development is doubtful and generally unsound.

With the exception of wet floodplain soils, few soils in Dallas have more than moderate limitations. Soils in the area north of Ellendale Avenue in the vicinity of Douglas Street have been shown to have high shrink-swell potential and some areas west and south require protective measures for steepness or low bearing strength.

Soils found throughout the area are predominantly of the Abiqua series. The Abiqua soils consist of well-drained soils formed from mixed silty and clayey alluvium. They occupy nearly level terraces or gently sloping alluvial fans. Permeability is moderately slow. Surface runoff is slow and the erosion hazard is slight.

Other soils series found in the area include the Cove series on the southern fringe, the Bellpine series on the western fringe, the Suver series on the eastern fringe, and the Salkum series on the eastern fringe. Various soil series in lesser amounts are found throughout the study area.

Surface Waters

Two main streams flow through the Dallas UGB. Rickreall Creek drains portions of the Coast Range and flows through Dallas as it enters the Willamette Valley, eventually meeting the Willamette River southwest of Salem near the Eola Hills. The Rickreall Creek watershed presently serves as both the drinking water source and wastewater disposal location for the City. During the summer, flow in Rickreall Creek is controlled by the dam at Aaron Mercer Reservoir, which is located approximately 8.5 miles west of Dallas near the headwaters of the creek. The City owns and operates the dam and owns water rights totaling 5.33 cfs from stream flow and 10 cfs from reservoir storage, according to the 1989 Dallas Water Supply Study (CH2M HILL). During high stream flow, water is stored behind the dam for discharge for consumption and to maintain minimum stream flows when stream flow is low.

The north fork of Ash Creek flows through the southern portion of the City. Although the north fork flows to within approximately 1,500 feet of Rickreall Creek, the two streams never meet. The north fork of Ash Creek flows southeast of Dallas and enters the Willamette River at Independence. Because of a very slight ridge between the two stream beds, the wastewater collection system uses lift stations to convey some of the wastewater flow (from the south side of town) to the wastewater treatment facility.

Climate

The Dallas area has a mild and temperate climate with a dry summer season and a rainy winter. Westerly winds generally pick up moisture from the Pacific Ocean. As a result of the orographic effect of the Coast Range, precipitation decreases as the winds flow eastward into the Willamette Valley. On the east side of the range, the amount of rainfall decreases sharply on the lower slopes and on the valley floors.

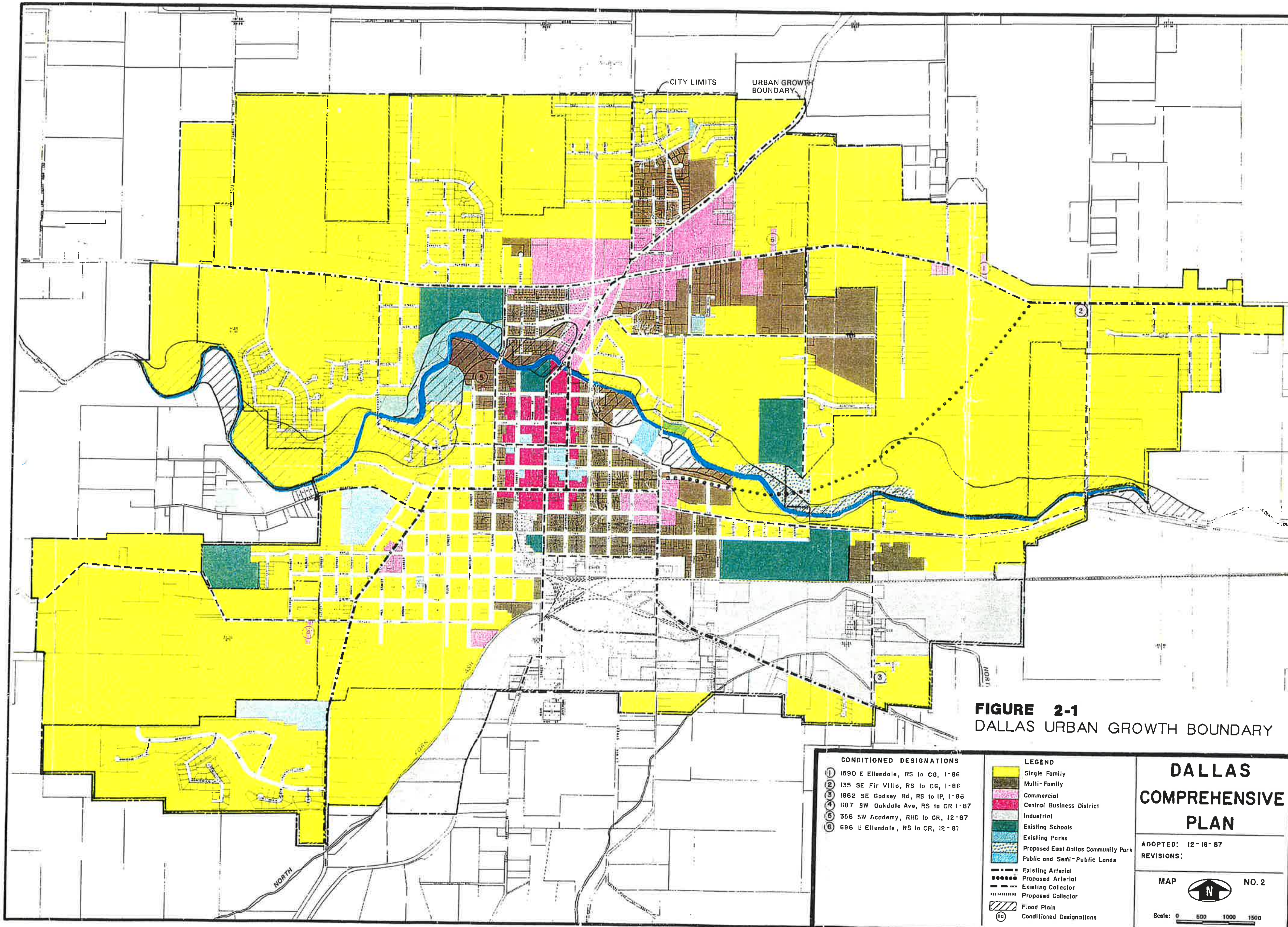


FIGURE 2-1
DALLAS URBAN GROWTH BOUNDARY

Historical climatic data for Dallas are shown in Table 2-1. Although summer days can be consistently sunny, continuous and prolonged hot weather is rare and nights are generally cool. Similarly, continuous and prolonged subfreezing weather is rare during the winter. Snowfall is usually light, averaging only a few inches per year. Over 80 percent of the mean annual precipitation falls between November and April.

Demographics

The City of Dallas has historically seen cyclical but steady growth. Substantial growth occurred in the 1960s and 1970s, but growth slowed in the early 1980s. The City's growth resumed at a moderate pace during the late 1980s and into the early 1990s. Future growth in Dallas is projected to continue on the basis of a diversified local economy, attractiveness as a place to live, and proximity to the Salem metropolitan area, which is also expecting continued growth. A more detailed discussion of the local economy and job base can be found in the *City of Dallas, Oregon, Comprehensive Plan*, December 1987. A more detailed discussion of historical population and population projections is included in Chapter 3, Future Conditions.

Land Use

Like all other Oregon cities, the City of Dallas maintains an Urban Growth Program. According to the City's Comprehensive Plan, the Dallas program's purpose is to provide for an orderly and efficient transition from rural to urban land use. The program provides a guide for urban expansion and sets limits within a reasonable planning period. Decisions for allocation of scarce public resources are the principal determinants for where and when development takes place.

Table 2-1
Historical Climate Data for Dallas, Oregon
(1951-1980)

Month	Average Max. Temp. (F)	Average Min. Temp. (F)	Average Mean Temp. (F)	Mean Precipitation (inches)
January	45.6	32.2	38.9	8.90
February	51.2	34.4	42.8	6.30
March	54.8	35.0	44.9	5.65
April	61.2	37.2	49.2	2.78
May	68.9	41.5	55.2	1.99
June	75.0	46.2	60.6	1.24
July	83.0	48.2	65.6	0.41
August	82.1	48.0	65.1	0.69
September	77.5	46.1	61.8	1.51
October	65.7	40.9	53.3	3.39
November	52.8	36.2	44.5	7.42
December	46.9	34.0	40.5	8.83
Total				49.10

Source: National Weather Service, Portland

Figure 2-1 shows the UGB and the areas within the UGB zoned as residential, commercial, and industrial. The total area encompassed by the UGB is 3,884 acres. According to the City's Comprehensive Plan, recent growth within the city limits appears to have been distributed uniformly, with perhaps a slight preference for north Dallas. For growth outside the city limits but within the UGB, there has been a marked preference for the northwest and southwest sectors.

The majority of vacant and buildable land both within the city, and outside the city but inside the UGB, is zoned residential. Vacant and buildable commercial and industrial land is also available. With the expected continued growth of Dallas, land will continue to be developed within the UGB in accordance with zoning requirements. Detailed data on zoning and development can be found in the *City of Dallas, Oregon, Comprehensive Plan*, December 1987.

Inventory of Existing Facilities and Operations

Wastewater Collection System

The City's existing sanitary wastewater collection system collects wastewater from residences, businesses, industries, and public facilities and conveys the water to the City's wastewater treatment facility. Flow through the collection system is mostly by gravity to the LaCreole interceptor, which conveys wastewater along the north bank of Rickreall Creek to the wastewater treatment plant. Four lift stations pump wastewater from areas that cannot flow by gravity to the treatment facility.

Approximately 1,800 acres of the UGB are presently sewered if parks and open space within the UGB are discounted. The total length of municipal sewer, excluding private service laterals, is approximately 40 miles and ranges in diameter from 6 to 27 inches. During extreme wet weather events, flow to the wastewater treatment facility (WWTF) periodically exceeds the hydraulic capacity of the collection system and the plant. Diluted raw sewage overflows to Rickreall Creek during these high flow events at up to two points in the collection system. Further details on the wastewater collection system are included in Chapter 5, Infiltration/Inflow Evaluation.

Wastewater Treatment Facility

Design Criteria

The existing WWTF is located approximately two miles east of the City and is adjacent to Rickreall Creek. An aerial view of the WWTF is shown in Figure 2-2. The secondary plant has been in operation since 1969 and has required no major improvements since that time. The facility features a complete-mix activated sludge secondary treatment system without primary sedimentation, coupled with aerobic digestion of secondary waste sludge.

Design criteria for the existing plant and design factors for unit treatment processes and equipment are shown in Table 2-2. The plant was originally designed in 1968 to treat high-strength, low-flow seasonal food processing wastes, but the cannery is no longer in operation. The original design criteria (1968) included effluent limitations of 30 mg/L for BOD and suspended solids. Summer effluent limitations contained in the City's NPDES permit, which expired in 1989, were 10 mg/L for BOD and suspended solids. The permit

FIGURE 2-2
AERIAL VIEW OF DALLAS WWTF

CH2M HILL

Table 2-2 Design Criteria and Design Factors of Existing WWTF	
Flow	
Design Average	2 mgd
Design Maximum	6 mgd
Design BOD Load	
Canning Season[a]	7,080 lb/d
Noncanning Season	2,080 lb/d
Design Effluent Requirements	
Maximum Monthly Average TSS	20 mg/L
Maximum Monthly Average BOD	20 mg/L
Influent Pumps	
Number	2
Type	2-speed, centrifugal
Speeds	900 and 1,200 rpm
Combined Capacity	4,160 gpm
Total Head	32 feet
Preliminary Treatment	
Shredder (comminutor)	
Number	1
Size	25-inch
Bar Screen	
Number	1
Spacing	1-inch
Aeration Basins	
Number	2
Depth	12 feet
Volume (each)	1.0 million gallons
Hydraulic Capacity (each)	6.0 mgd
Design Organic Loadings[b]	0.23 lb BOD/lb MLVSS/day 26 lb BOD/1,000 cu. ft./day
Aeration Equipment	
Number of Aerators (each basin)	4
Type	2-speed, floating, mechanical surface type
Size	25 hp
Clarifier	
Number	1
Diameter	60 feet
Side Water Depth	10 feet
Surface Overflow Rate[c]	707 gal/d/sq.ft.
Solids Loading Rate[c,d]	26 lb/d/sq. ft.
Detention Time[c]	2.5 hours
Sludge Removal	revolving suction arm

Table 2-2 Design Criteria and Design Factors of Existing WWTF	
Sludge Recirculation	
Number of Pumps	2
-Type	1 single-speed, 1 variable-speed
Combined Capacity	~1,380 gpm
Recycle Rate[c]	0.25 to 1.0
Flow Measurement	
Plant Flow	propeller meter on clarifier discharge
Recycled Sludge Flow	hand-held propeller meter at splitter box
Waste Sludge	timing at constant pump rate
Chlorination	
Type	v-notch chlorinator
Control	flow-paced
Reactor	chlorine contact channel
Volume	129,167 gal
Detention Time[c]	1.55 hours @ 2.0 mgd
Sludge Digestion	
Number	1
Type	aerobic flow-through without thickening
Volume	480,000 gallons
Detention Time[e]	
4,000 mg/L solids to digester	5.2 days
8,000 mg/L solids to digester	10.4 days
Oxygen Supply and Mixing	30-hp floating mechanical aerator
Minimum Digested Sludge Age[e]	
4,000 mg/L solids to digester	15.2 days
8,000 mg/L solids to digester	30.4 days
Digested Sludge Dewatering and Storage	
Method	humus ponds
Number	2
Area, Each	67,000 sq.ft.
Total	3.1 acres
Supernatant Drainage	return to plant influent
Operating Range	dry to 3-foot depth of water
Emergency Storage	
Method	discharge to humus pond No. 1
Detention Time[c]	18 hours

[a]Original design criteria included a 5,000 lb/d industrial BOD; however, cannery is no longer in existence.
[b]At 3,500 lb BOD/d/basin and 2,200 mg/L MLSS.
[c]At average design flow of 2.0 mgd.
[d]At 2,200 mg/L MLSS and 1.0 recirculation ratio.
[e]At design loading.

has recently been modified to meet water quality criteria and is discussed in Chapters 4 and 6. The current permit is in Appendix A.

An innovative cost-saving design feature of the existing plant is the use of low-permeability earthen and shotcrete lined basins for the aeration basins, chlorine contact channel, aerobic digester, and humus ponds. Shotcrete was used to line the entire chlorine contact channel as well as the slopes of the aeration basins and digester. The aeration basins and digester have native clay bottoms with concrete pads to prevent erosion, and reinforced concrete ring walls. The humus ponds are constructed entirely of native soil.

Facility Description

A flow schematic of the existing WWTF is shown in Figure 2-3. Wastewater from the collection system enters the plant through a 36-inch-diameter sewer pipe that crosses underneath Rickreall Creek and enters the influent pump station wet well. The raw wastewater is pumped through an 18-inch-diameter pressure pipeline to the headworks. The raw wastewater, which carries rags and debris that are shredded by the shredder (comminutor), and the wastewater is conveyed by gravity to the aeration basin splitter box. At the splitter box, raw wastewater and return activated sludge combine and the mixture is discharged to one or both of the complete-mix aeration basins. Under normal operation, a manual bar screen is available as a bypass when the shredder is out of service. Also, because of the loss of the cannery waste load, only one aeration basin is normally in service. Activated sludge from the aeration basins flows by gravity to the single secondary clarifier, where the sludge settles. The aeration basins have a capacity of 1.0 million gallons each. Oxygen is supplied to each basin by four 25-hp, two-speed, floating mechanical surface aerators.

The secondary clarifier is 60 feet in diameter and has a 10-foot water surface depth. The activated sludge to be returned to the aeration basin (return activated sludge or RAS) is removed from the bottom of the clarifier by six suction pipes mounted on the revolving clarifier withdrawal arms. Sludge flow is by gravity to the return sludge pump station, which is located adjacent to the secondary clarifier. The sludge recirculation pumps lift the sludge back to the splitter box. Excess, or waste, activated sludge (WAS) is collected in a hopper at the bottom of the clarifier by the revolving rake arm and is pumped to the aerobic digester by a self-priming sludge pump in the Pump Room of the Control Building. The aerobic digester is 90 feet in diameter with a maximum water depth of 12 feet. Oxygen is supplied to the aerobic digester by a 30-hp, constant-speed, floating mechanical surface aerator.

Clarifier effluent flows by gravity through the flow measurement box to the chlorine contact channel. Chlorine is injected just downstream of the flow measurement box. The chlorine contact channel is 450 feet long and provides a 1.55-hour contact time at an average design flow of 2.0 mgd. Wastewater flows through the chlorine contact channel to the outfall and into Rickreall Creek. The outfall is comprised of a 24-inch-diameter concrete pipe that discharges to a sloped concrete flume extending down the stream bank to the water. The flume contains no diffuser.

A sludge pump in the Pump Room of the Control Building transfers the digested sludge to one, or both, humus storage ponds, where it is further stabilized and dried. The two humus ponds are 67,000 square feet each. The supernatant from the humus ponds flows by gravity to the plant influent line upstream of the influent pump station wet well. During normal

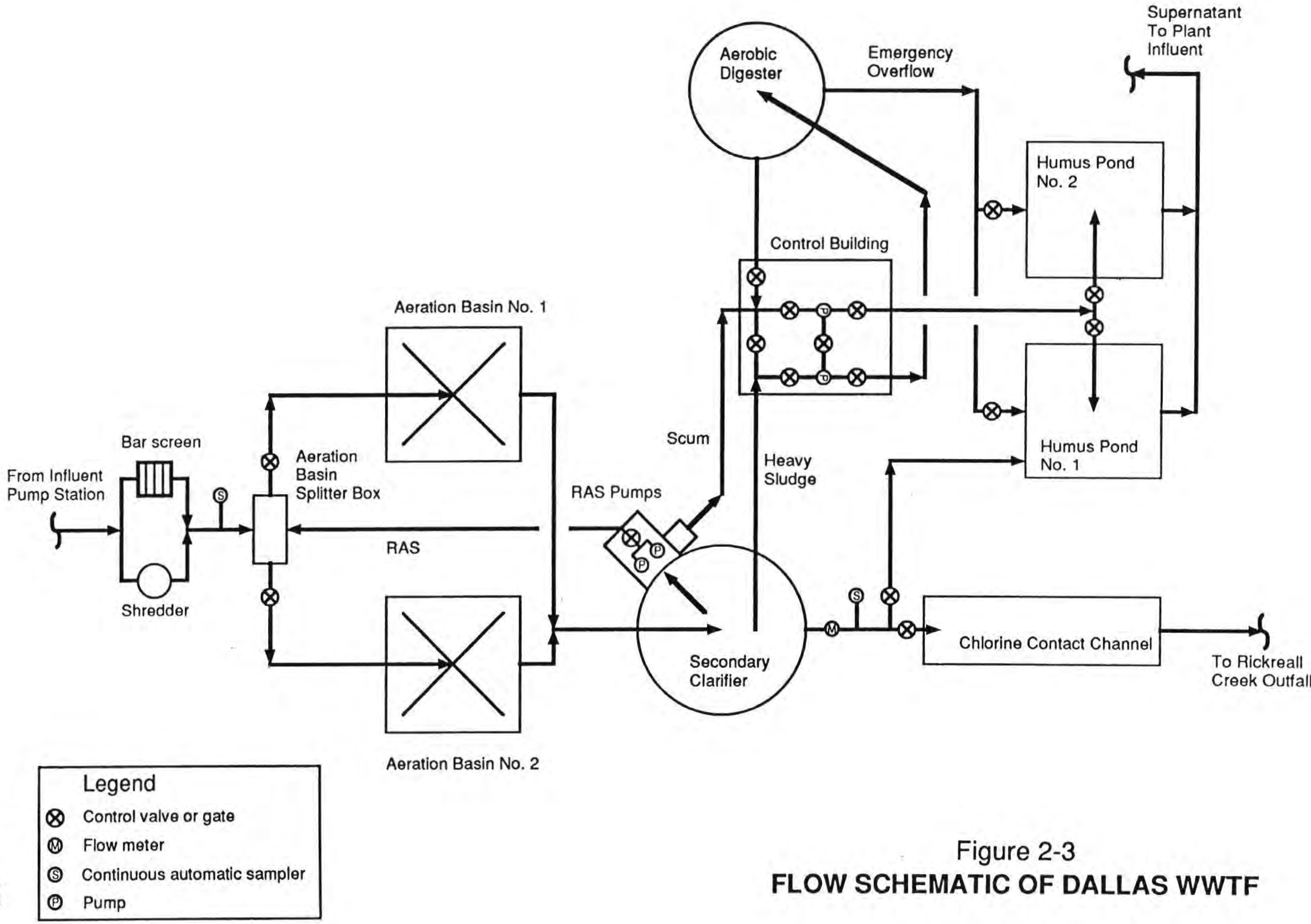


Figure 2-3
FLOW SCHEMATIC OF DALLAS WWTF

operation, only one of the humus ponds receives digested sludge, while sludge in the second humus pond is drying prior to removal and disposal. Current stabilized sludge (biosolids) disposal occurs once per year. Biosolids are excavated from the single dried humus pond in the fall and hauled to a local landfill for incorporation as landfill cover material.

Existing Wastewater Flows and Characteristics

Plant Flows

Historical WWTF flows from 1988 to 1992 are presented in Table 2-3. Flows include estimates of flows in excess of 6 mgd, which currently bypass the WWTF. Flows to the plant follow a conventional wet season/dry season pattern. Dry weather (May through October) average daily flow (DWADF) has averaged 1.60 mgd over the last 5 years, while wet weather (November through April) average daily flow (WWADF) has averaged 3.36 mgd. During the year, flows are typically at a minimum in September and peak in February. A plot of monthly average flows for the period 1988 to 1992 is shown in Figure 2-4. Monthly flows from 1992 are also plotted in Figure 2-4. Because several years have passed since the original review of existing flows, flow data for the last 3 years (1993-95) were reviewed to update the existing flow conditions. The current data indicate that flows to the WWTF are still at the 1990 levels published in the August 1994 Facility Plan. Specifically, the DWADF is still 1.60 mgd, which is equal to the value recorded for 1990. The current data show similar results for the other flow conditions, including dry weather maximum month average daily flow (DWMMADF), WWADF, and wet weather maximum month average daily flow (WWMMADF) (see Table 2-3 for comparison of 1988 to 1992 data from the August 1994 Facility Plan versus summary of 1993 to 1995 data). Three factors are believed to be the cause of this occurrence:

- The City has continued to work on correcting infiltration and inflow problems
- The City aggressively worked with residential and commercial users to reduce water consumption
- Industrial users implemented water conservation measures.

Each of these efforts has resulted in a reduction in wastewater flows.

Estimates of the residential, commercial, and industrial components of the metered water use for the City are shown in Table 2-4. An average of 1.37 mgd of potable water was treated during January, February, October, November, and December of 1992. The industrial component of the water use was 35 percent. Willamette Industries (23 percent) and Praegitzer Industries (12 percent) accounted for essentially all of the industrial use. Because of consumptive water uses, Willamette Industries estimates that only 50 percent of their water is returned to the sanitary sewer. Currently, neither industry foresees significant increases in their flows to the wastewater collection system.

Wet weather (winter) potable water use should theoretically equal the dry weather (summer) wastewater base flow. The wastewater base flow is the total wastewater flow less groundwater infiltration and rain-induced infiltration and inflow. Flow records from 1992 through 1994 show summer wastewater flows of 117 gpcd on average during August and

Table 2-3
Historical Dallas WWTF Flow Data

	1988-1992		1993-1995	
Monthly Average Flows (mgd)[a]				
January	4.04		*3.66*	
February	4.32		*3.18*	
March	3.51		*3.46*	
April	2.67		*3.12*	
May	2.02		*1.99*	
June	1.74		*1.78*	
July	1.49		*1.47*	
August	1.52		*1.39*	
September	1.35		*1.37*	
October	1.48		*1.60*	
November	2.12		*2.76*	
December	3.54		*3.92*	
Dry Weather Flows (mgd) - May through October				
Dry Weather Average Daily Flow (DWADF)	1.60		*1.60*	*May 95*
Dry Weather Maximum Daily Flow (DWMDF)	4.44	May 91	*4.01*	*Aug 94*
Dry Weather Minimum Daily Flow (DWMiDF)	0.86	Aug 92	*0.93*	*May 95*
Dry Weather Maximum Month Average Daily Flow (DWMMADF)	2.50	May 91	*2.23*	*Sep 93*
Dry Weather Minimum Month Average Daily Flow (DWMiMADF)	1.11	Oct 88	*1.29*	
Wet Weather Flows (mgd) - November through April				
Wet Weather Average Daily Flow (WWADF)	3.36		*3.40*	
Wet Weather Maximum Daily Flow (WWMDF)	[b]		[b]	
Wet Weather Maximum Month Average Daily Flow (WWMMADF)	6.76	Feb 90	*4.65*[c]	*Dec 94*

[a]*Wet weather flows include estimates of bypass flows to Rickreall Creek.*
[b]*Unknown due to bypass flows.*
[c]*Does not include estimate of bypassed flow.*

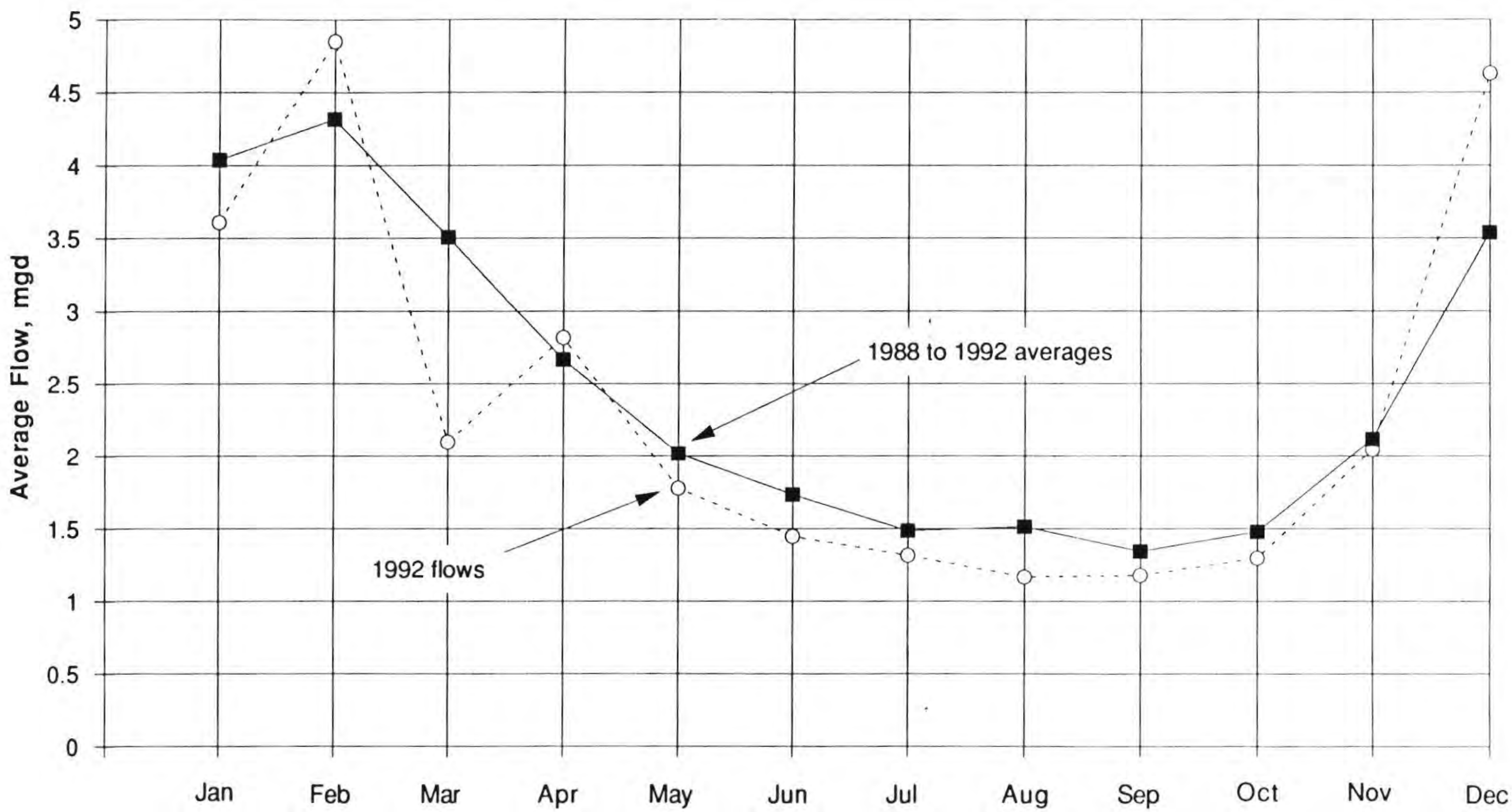


Figure 2-4
AVERAGE MONTHLY FLOWS AT DALLAS WWTF, 1988-1992

Table 2-4 City of Dallas Metered Water Use Flow Components				
		Metered Water Flow[b]		
Type of Account	Number of Accounts[a]	(mgd)	(% of total)	Per Capita Flows[c] (gal/capita/day)
Residential				
Single Family	2,709	0.52	37.96	44.41
Multifamily	132	0.11	8.03	9.40
Residential Subtotal	2,841	0.63	45.99	53.81
Commercial				
Schools	6	0.02	1.46	1.71
Retirement Homes	5	0.04	2.92	3.42
Parks	6	0.06	4.38	5.12
Other	248	0.14	10.22	11.96
Commercial Subtotal	265	0.25	18.98	22.21
Industrial				
Willamette	1	0.31	22.63	26.48
Praegitzer	1	0.17	12.40	14.52
Other	12	<0.01	~0.0	~0.85
Industrial Subtotal	14	0.49	35.03	41.85
Total Base	2,909	1.37	100.00	117.87

[a] Based on 1996 accounts.

[b] Based on 2 years of metered water use data from Jan., Feb., Oct., Nov., and Dec. (provided by City).

[c] Assume number of water users is 10,850 (1995 City population) plus 858 additional users within the urban growth boundary but outside city limits (estimated from 1989 Water Study).

September. Based on the 1992 population served, this equates to 1.25 mgd of wastewater base flow. The difference between the summer wastewater flow of 1.25 mgd and the winter water use of 1.37 mgd is a result of the unreturned water from Willamette Industries and other residential, commercial, and industrial consumptive water uses.

The 117 gpcd wastewater flow represents the composite (residential, commercial, and industrial) base flow because infiltration and inflow from all sources should have been negligible during August and September. The revised base flow of 117 gpcd was used in Chapter 3, Future Conditions, for projecting future wastewater flows. In the 1994 Facility Plan, a composite base flow of 122 gpcd was used for the same projections. As previously discussed, this reduction in base flow is the result of infiltration and inflow reductions, reduced residential and commercial consumption, and industrial water conservation measures.

Plant Influent and Effluent Characterization

Historical WWTF influent and effluent loads from 1988 to 1992 are compared against data from 1993 to 1995 in Table 2-5. Plant influent BOD and TSS values are typical for those of a weak domestic wastewater (as defined by *Wastewater Engineering*, 2nd ed.). The main reason for the dilute nature of the plant influent is the high percentage of industrial flows from Willamette Industries and Praegitzer Industries, which add little BOD and TSS. Wet weather concentrations of BOD and TSS are over 35 percent lower than dry weather concentrations because of the dilution effect of infiltration and inflow entering the wastewater collection system. Plant effluent BOD and TSS values are typically below 10 mg/L during dry weather and wet weather.

Previous NPDES permits did not require monitoring of nutrients; thus, nitrogen and phosphorus data are limited. Limited nitrogen data (5 samples) for influent and effluent were collected during the fall of 1992 and are shown in Table 2-5. Only effluent phosphorus data were collected weekly throughout the dry weather season in 1992 and are shown in Table 2-5. Both influent and effluent data for total phosphate and orthophosphate were collected from 1993 to 1995.

Plant Biosolids Data

Historical WWTF biosolids data from 1989 to 1995 are presented in Table 2-6. Since 1989, all measured metals concentrations have been below ceiling limits for land application of sludge as defined by recent federal regulations (40 CFR, Part 503). In recent years, copper concentrations in the biosolids have increased and are approaching the ceiling limits (see Table 6-13) of 40 CFR Part 503. The increase in copper concentrations is likely due to production increases at Praegitzer Industries.

Biomonitoring Results

CH2M HILL performed two acute and chronic bioassays on dechlorinated Dallas WWTF effluent during October 1992. Test organisms used were the water flea (*Ceriodaphnia dubia*) and the fathead minnow (*Pimephales promelas*). USEPA test methods were followed for all procedures.

Table 2-5
Historical Dallas WWTF Influent and Effluent Characterization

Parameter	Unit	1988-1992 Average Influent	1988-1992 Average Effluent	1993-1995 Average Influent	1993-1995 Average Effluent
BOD - 5 day[a]					
Dry Weather					
Concentration	mg/L	98.0	6.7	141	7.2
Total	lb/d	1,303	88.3	1,798	96
Wet Weather					
Concentration	mg/L	61.8	6.6	77	8.0
Total	lb/d	1,559	171	1,947	212
TSS[a]					
Dry Weather					
Concentration	mg/L	102	6.0	133	6.7
Total	lb/d	1,348	79.6	1,673	82
Wet Weather					
Concentration	mg/L	63.2	8.2	82	9.4
Total	lb/d	1,618	215	2,132	256
TKN					
Concentration	mg/L as N	20.7[b]	9.7	27.8	7.0
Total	lb/d as N	253	119	-	-
Ammonia					
Concentration	mg/L as N	17.9[b]	5.6	18.8	5.2
Total	lb/d as N	221	74	-	-
Nitrate					
Concentration	mg/L as N	1.1[b]	9.5	0.5	0.1
Total	lb/d as N	11.0	109.5	-	-
Nitrite					
Concentration	mg/L as N	0.02[b]	0.36	0.08	4.5
Total	lb/d as N	0.3	4.3	-	-
Total Phosphate[c]					
Dry Weather			5.4	8.5[d]	4.7
Concentration	mg/L as P	-	61.0	-	-
Total	lb/d as P	-			
Orthophosphate[c]					
Dry Weather					
Concentration	mg/L as P	-	4.6	9.0[d]	4.2
Total	lb/d as P	-	52.0	-	-

[a] Weekly data.
[b] Five samples from September to November 1992.
[c] Weekly data from May to October.
[d] Based on limited data set. Orthophosphate should be less than total phosphate.

Table 2-6
Historical Dallas WWTF Biosolids Data
1989-1995

Sample Date	7/12/89	4/89 to 10/11/89	10/13/89 to 6/13/90	5/15/91	9/24/92	5/92 to 4/14/93	10/12/93	9/14/94	9/18/95
Sample Location	E. Humus	Digester	Digester	E. Humus	W. Humus	Digester	E. Humus	W. Humus	E. Humus
Sample Type	composite	composite	composite	composite	composite	composite	composite	composite	composite
Measured Parameter									
Total solids (%)	93.6			94.1	74.4		72.4	73.4	74.6
Total volatile solids (%)	65.8			73.9	38.3		40.1	30.4	30.2
TKN (% dry weight)	4.19			2.71	0.61		0.57	1.49	3.26
Nitrate (% dry weight)	0.023			0.011	<0.001		0.001	<0.001	<0.005
Ammonia (% dry weight)	0.54			0.30	0.27		0.15	0.37	0.58
Phosphorus (% dry weight)	0.12				0.10		2.84	0.01	1.43
Potassium (% dry weight)	0.122				0.002		0.381	0.105	0.333
Arsenic (mg/kg)						4.71	0.10	6.52	<0.5
Cadmium (mg/kg)	4.99	3.80	1.82	1.09	<1	<0.5	0.10	24.90	0.91
Chromium (mg/kg)	107	153	85	21		4	10	47	8
Copper (mg/kg)	1273	2663	769	221	768	1597	1395	1929	3814
Lead (mg/kg)	181	156	6	<1	<1	4	10	483	46
Mercury (mg/kg)						<0.5	<0.1	<0.1	<0.001
Molybdenum (mg/kg)						<0.5	<0.1	<1	<0.5
Nickel (mg/kg)	122	71	46	<1	105	21	199	144	110
Selenium (mg/kg)						<0.5	<0.1	75.7	<0.5
Zinc (mg/kg)	737	364	336	144	268	787	271	297	347

The concentrations of dechlorinated effluent used for the tests were 1, 3, 10, 30, and 100 percent effluent. A test was also performed with 100 percent dilution water as a control. The water fleas and fathead minnows each showed no statistically significant reduction in survival, growth, or reproduction when compared to the control. Therefore, the bioassay testing revealed no acute or chronic toxicity concerns for dechlorinated WWTF effluent at present. Future bioassay testing will be required by the NPDES permit. Details of the bioassay testing can be found in a separate report (*Bioassay Report*, CH2M HILL, November 1992).

Identification of Existing Deficiencies

Deficiencies of the existing wastewater treatment facilities are discussed in the following section under four categories: Water Quality Regulations, Process Equipment, Controls, and Building Codes and Safety.

The Dallas WWTF has been in service since 1969 with year-round discharge to Rickreall Creek. No major improvements to the facility have been necessary since initial construction, and the plant has generally met discharge requirements consistently. The facility has been well-maintained, especially considering the plant is approaching 25 years of service. Due to the change from effluent-based to water-quality-based standards since the WWTF was placed in service, the Oregon Department of Environmental Quality (DEQ) has identified areas of noncompliance with the new water-quality-based standards. In addition, building and safety codes have changed since the WWTF was built. Much of the equipment at the WWTF has met or exceeded its design life and, as a result, some equipment may warrant replacement or modification.

Water Quality Regulations

Existing Noncompliance Issues

In August 1989, the City's NPDES Waste Discharge Permit expired and was renewed following DEQ's evaluation of water quality compliance issues. The current permit is in Appendix A. Since 1989, the DEQ has performed studies and evaluations on Rickreall Creek and at the Dallas WWTF outfall.

On December 19, 1991, a Notice of Noncompliance from DEQ was received informing the City that current studies now indicate that Rickreall Creek will be placed in the Federal Register as a water quality limited stream during the summer months because of high coliform bacteria and nutrients. Noncompliance issues presently identified in DEQ's December 19, 1991, correspondence related to the City of Dallas permit renewal process include the following:

- Less than 85 percent BOD/TSS removal
- Wet weather bypasses
- Inadequate reliability
- Seasonal nonconformance with state water quality criteria
- Outfall mixing zone
- Chlorine toxicity
- Fecal coliform

The City and DEQ entered into a Stipulation and Final Order agreement on June 30, 1992. The agreement (see Appendix B) contained the following compliance schedule to address the noncompliance issues:

- Before July 31, 1992, the City must submit a public notification plan to inform the public during periods of discharge of untreated sewage. (This deadline was met.)
- Before September 30, 1993, the City must submit a comprehensive draft facilities plan that proposes a selected alternative for an upgraded facility. A draft plan was submitted in September 1993 and after DEQ review was reissued in August 1994 for public review and comment. Because of issues raised during public review, the reclassification of the lower reach of Rickreall Creek to nonsalmonid, and because of amendments adopted in January 1996 to (OAR) 340-41-445, DEQ provided the City with an opportunity to amend the plan. The City and DEQ agreed to a new submittal date of April 1, 1996.
- Within 10 months after DEQ issuance of a new NPDES discharge permit, the City must submit final plans and specifications for new wastewater treatment facilities.
- Within 30 months of DEQ approval of final plans and specifications, new wastewater treatment facilities must be operational.

The above noncompliance issues, which must be corrected with the proposed new facilities, are discussed below.

Less Than 85 Percent BOD/TSS Removal. Due to wet weather infiltration/inflow (I/I), the plant influent BOD and TSS concentrations are significantly diluted. As a result, the existing secondary WWTF is not capable of providing an effluent quality during the winter months that consistently achieves the federal Secondary Treatment Standard (see 40 CFR Part 133) of 85 percent BOD/TSS removal. Also, as mentioned previously, the influent BOD and TSS values are typical for those of a weak domestic wastewater, thereby making 85 percent removal more difficult.

Wet Weather Bypasses. Any bypass of secondary treatment is a violation of federal water quality regulations. The WWTF influent pump station is the primary bypass point of the two bypass points in the collection system (see Chapter 5, Infiltration/Inflow Analysis, for details). Volumes of wastewater bypasses at the WWTF influent pump station have been estimated by City staff and are presented in Table 2-7. The flows were estimated by calculation using the pipe diameter, pipe slope, and depth of water in the pipe. (The bypass pipe at the WWTF influent pump station contains a heavy flap gate at the discharge end. The water depth measured in the pipe was artificially high due to the restriction caused by the flap gate. Thus, the volumes estimated are suspected to be significantly higher than actual volumes.)

Inadequate Reliability. Since the Dallas WWTF was built, the USEPA has developed criteria for reliability and redundancy provisions that must be followed for new or expanded municipal wastewater treatment facilities (see technical bulletin "Design Criteria For Mechanical, Electrical, and Fluid System Component Reliability"). For example, the lack of standby or alternate power at the Dallas WWTF necessary to prevent bypassing during a power outage was cited by DEQ as a violation. Besides standby power, other reliability improvements may be required at the existing Dallas WWTF, such as provisions for additional redundant treatment units and equipment. It is anticipated that the Dallas

Table 2-7
Historical Dallas WWTF
Bypass Monitoring Summary

1989

MO-YR	Total Bypass Events	Duration (hrs)	Estimated Flow* (Mgal)
Jan-89			
Feb-89			
Mar-89	3	280.3	22.8
Apr-89			
May-89			
Jun-89			
Jul-89			
Aug-89			
Sep-89			
Oct-89			
Nov-89	1	4.0	0.3
Dec-89	3	44.0	3.3
Total	7	328.3	26.3

1990

MO-YR	Total Bypass Events	Duration (hrs)	Estimated Flow* (Mgal)
Jan-90	4	219.0	27.1
Feb-90	5	294.0	27.0
Mar-90	1	1.0	0.0
Apr-90			
May-90			
Jun-90			
Jul-90			
Aug-90			
Sep-90			
Oct-90			
Nov-90	2	34.0	0.2
Dec-90	2	34.5	0.3
Total	14	582.5	54.7

1991

MO-YR	Total Bypass Events	Duration (hrs)	Estimated Flow* (Mgal)
Jan-91	1	59.0	2.9
Feb-91	1	12.0	2.6
Mar-91	2	142.0	8.7
Apr-91	2	140.0	11.8
May-91			
Jun-91			
Jul-91			
Aug-91			
Sep-91			
Oct-91			
Nov-91	1	3.0	0.0
Dec-91			
Total	7	356.0	26.0

1992

MO-YR	Total Bypass Events	Duration (hrs)	Estimated Flow* (Mgal)
Jan-92			
Feb-92	1	148.0	28.3
Mar-92			
Apr-92			
May-92			
Jun-92			
Jul-92			
Aug-92			
Sep-92			
Oct-92			
Nov-92			
Dec-92	3	240.0	14.4
Total	4	388.0	42.7

* Reported volumes are suspected to be significantly higher than actual volumes. The water depth measured in the pipe, used to calculate flow, was artificially high due to the restriction caused by the flap gate.

WWTF will need to meet Class II reliability for discharge to Rickreall Creek or Class I reliability for discharge to the Willamette River. WWTF components that do not meet the redundancy criteria (as defined in Chapter 6, Water Quality and Regulatory Standards and Criteria) include:

- Standby power supply for critical processes
- Influent pumps (redundant pump needed)
- Secondary sedimentation [redundant tank(s) needed]
- Disinfection (redundant tank and chlorinator needed)
- Aerobic digester (redundant aerator needed)
- Sludge pumping (redundant pump needed)
- RAS pumping (redundant pump needed)

A summary of the USEPA reliability and redundancy criteria is presented in Chapter 6.

Seasonal Nonconformance With State Water Quality Criteria. The Oregon Administrative Rules (OAR 340-41) define a State-Wide Water Quality Management Plan. Beneficial Uses, Water Quality Standards, and Minimum Design Criteria for Treatment and Control of Wastes related to Rickreall Creek are included under the Willamette Basin Plan (OAR 340-41-442,445,455). Special Willamette Basin Policies and Guidelines (OAR 340-41-470) specifically addressing comprehensive rules and discharge standards for Rickreall Creek and the City of Dallas are summarized in Chapter 6, Water Quality and Regulatory Standards and Criteria.

Seasonal violations of state water quality criteria presently cited by DEQ are based on the inadequate dilution of the Dallas WWTF effluent by Rickreall Creek low stream flows during the summer months, resulting in the stream's inability to assimilate waste discharges during the dry weather season. The specific violations cited by DEQ include an inadequate effluent outfall mixing zone, and exceedence of both acute and chronic chlorine toxicity levels during summer low stream flows.

Outfall Mixing Zone. In August 1988, DEQ performed a mixing zone survey of the Dallas outfall in Rickreall Creek. During the mixing zone survey, the DEQ observed poor mixing, with the WWTF effluent plume following one bank of the stream. Testing results also indicated water quality violations both upstream and downstream of the Dallas WWTF outfall. Downstream violations included excessive chlorine, bacteria, and nutrients. High bacterial counts were also measured upstream of the WWTF. Phosphate concentrations downstream from the Dallas outfall were 1.8 mg/L, exceeding the water quality criteria of 0.1 mg/L. Testing at the time of the mixing zone survey indicated the WWTF effluent quality met the current NPDES permit effluent limitation requirements.

Dallas' current NPDES permit defines the outfall mixing zone as a region within a 100-foot radius around the point of discharge. The current permit allows the entire width of Rickreall Creek to be used as the mixing zone. DEQ has indicated that the geometry of the mixing zone will need to be evaluated to address the issue of fish passage as discussed in OAR 340-41-445. According to OAR 340-41-445, the water outside this mixing zone boundary must be free of materials in concentrations that will cause chronic toxicity, and it must meet all other water quality standards under normal annual low flow periods. Water inside the mixing zone must be free of materials in concentrations that will cause acute toxicity.

Chlorine Toxicity. For chlorine, acute and chronic toxicity concentrations are defined as 0.019 and 0.011 ppm, respectively. In order to meet the requirements of OAR 340-41-445, the WWTF effluent chlorine concentration must be less than 0.019 mg/L and adequate dilution and mixing must take place in the river for concentrations outside the mixing zone to be 0.011. The practical limit for measurement of chlorine concentration is 0.1 mg/L. Thus, practically speaking, no measurable chlorine concentration is allowed in discharges to Rickreall Creek. The Dallas WWTF does not currently dechlorinate and residual chlorine concentrations are above the acute toxicity limit.

Bacteria. Dallas' current NPDES permit requirement for fecal coliform is an average monthly concentration of 200 counts per 100 mL, with an average weekly concentration of 400 per 100 mL. OAR-340-445 requires that coliform organisms associated with fecal sources not exceed a log mean of 200 fecal coliform per 100 mL based on at least 5 samples in a 30-day period. No more than 10 percent of the samples can exceed 400 organisms per 100 mL. See Chapter 6 for recent amendments to the bacteria criteria.

During the mixing zone survey conducted by DEQ in August 1988, WWTF effluent and stream fecal coliform and enterococcus were tested. The WWTF effluent fecal coliform count was 60 colonies per 100 mL and the enterococcus count was less than 4 colonies per 100 mL. Upstream background concentrations in Rickreall Creek were greater than 200 for fecal coliform and greater than 80 for enterococcus. These test results indicate that upstream sources other than Dallas WWTF may be responsible for exceeding the water quality bacterial standards.

Other Regulatory Issues

Oregon Administrative Rule OAR 340-41-455-(1)-(f) contains a minimum dilution rule for wastewater treatment plant discharge with respect to allowable effluent BOD concentrations, receiving stream flows, and wastewater treatment plant flows. This is a "rule of thumb" standard presently used by the state to prevent water quality violations. Based on the 7Q10 stream flows, the existing Dallas WWTF effluent discharged to Rickreall Creek would be in violation of the BOD dilution criteria approximately 7 months per year (May through November), assuming a 10 mg/L BOD effluent. In addition, the State Water Quality rule states that point dischargers to water quality limited streams will not be allowed an increase in mass loadings to accommodate growth and that greater treatment efficiencies will be required. The DEQ may choose to use an alternative criteria to the minimum dilution rule. This alternative criteria could include the criteria determined by the water quality modeling analysis (refer to Chapter 4, Rickreall Creek Water Quality and Toxicity Analysis).

Process Equipment

In addition to equipment items already mentioned under Reliability and Redundancy, the following equipment and treatment units should be considered for upgrade or replacement.

Improvements to the headworks should be considered to remove debris such as rags and plastics from the sludge. Grit has accumulated in aeration basins over the life of the plant, and this accumulation reduces the effective volume of the basins.

The aeration basins provide sufficient volume and oxygen transfer capability for meeting current discharge standards. However, the completely mixed system would not be conducive to creating anoxic zones should nutrient removal become necessary to meet future discharge standards. Also, a completely mixed system is more susceptible to producing a poorly settling sludge. New groundwater regulations may require that the bottom of the aeration basins be lined.

The RAS pumps do not provide sufficient capacity due to increased flows to the WWTF during high flow periods. The two existing pumps can deliver up to 2 mgd. The desirable capacity is 60 percent of peak flow, or 3.6 mgd for the Dallas WWTF. Therefore, larger pumps are needed.

During high flow periods, the secondary clarifier has difficulty in retaining solids. A redundant clarifier would decrease the overflow and solids loading rates as well as satisfy reliability and redundancy criteria. Also, a McKinney-type weir baffle would prevent flow/density currents from carrying solids up the clarifier wall, thereby increasing solids removal efficiency.

Based on the new sludge regulations adopted by the USEPA (40 CFR, Part 503), the aerobic digester alone will not be able to meet the requirements for pathogen reduction because of short detention times and low operating temperatures. However, with modifications to the aerobic digester and humus pond, or by the addition of new processes such as lime stabilization, both pathogen and vector attraction reduction requirements are attainable. The new 503 regulations are discussed in more detail in Chapter 6, Water Quality and Regulatory Standards and Criteria.

The pipe from the sludge pumps to the humus ponds has occasionally plugged with rags, causing the digester to overflow. To reduce the likelihood of digester overflows, rags should be removed at the headworks or the pipe size to the humus pond should be increased. In addition, state groundwater regulations (see OAR 340-40) may result in the need to line the earthen digester bottom.

The existing chlorine gas disinfection system adequately disinfects effluent to meet the existing 200 counts per 100 mL fecal coliform standard. Chlorine toxicity in Rickreall Creek has been cited by DEQ as a violation of water quality standards (see OAR 340-41-445). For continued discharge to Rickreall Creek, a dechlorination system may be required if chlorine disinfection is continued, or an alternative disinfection process such as UV should be considered. A Willamette River discharge may allow a residual of 1 mg/L or higher, a level attainable by chlorination alone. A separate chlorinator should be provided for RAS chlorination, along with piping to the RAS line. Modification of the chlorine contact channel to provide a longer length-to-width ratio may be required should disinfection standards change or if effluent reuse is selected as a disposal means.

The existing sludge pumps in the Control Building have exceeded their useful life expectancy and need replacement. More laboratory space in the Control Building is needed because of the increase in analytical testing required by current discharge permits. Several pieces of laboratory equipment need replacement and additional new equipment for the lab is needed to maintain quality control and provide proper lab safety. Some of the items include a new refrigerator, a new BOD incubator, a new oven, an acid locker, and an explosion-proof locker for gas storage. In addition to lab space, other space needs include operator locker and lunch facilities.

The humus ponds, as currently operated with the digester, have reached their design capacity for drying. In addition, state groundwater regulations (see OAR 340-40) may result in the need to line the humus ponds.

Controls

There is a general need at the WWTF for improved plant monitoring and process control to allow more efficient operation. Specific monitoring and control needs that should be considered include acquiring or upgrading the following equipment:

- A permanent RAS flowmeter to monitor return sludge flow to the aeration basins
- A WAS flowmeter to accurately monitor the waste sludge volumes pumped to the digester
- An influent flowmeter to monitor the plant's raw wastewater flows
- Improvements to the effluent flow monitoring equipment for better control of the disinfection process
- The influent and effluent composite samplers in the Control Building have reached their design life and should be replaced.
- Implementation of a computerized control and monitoring system should be considered to optimize operations and maintenance.

Building Codes and Safety

Various building codes and safety regulations have changed since the Dallas WWTF was constructed. New municipal wastewater plants are required to be designed in accordance with National Fire Protection Act (NFPA) 820, which stipulates various ventilation rates and electrical classifications to be used for safety. While the unremodeled portions of existing plants are not required to be upgraded to NFPA 820 standards, all new or significantly remodeled portions of the plant would need to be upgraded to meet the standard. For those areas not requiring remodeling, NFPA 820 does represent a good set of recommendations for possible upgrades to improve system safety.

The existing chlorination facility is in need of safety improvements. Recent revisions to the Uniform Fire Code, Article 80, require emergency chemical scrubbing equipment for toxic compressible gases. A sprinkler system is also required if the building is constructed of flammable materials. The local fire marshal may require these improvements if the facility is upgraded. The existing manual hoist system for moving chlorine ton containers should be replaced. Other regulations that may affect the facility upgrade are the Disabilities Act and Occupational Safety and Health Administration (OSHA) requirements.

Chapter 3
Future Conditions

CHAPTER 3

FUTURE CONDITIONS

Introduction

This chapter discusses the projected future conditions of the study area. Projected population, wastewater flows, and wastewater characteristics are presented and discussed. Effluent limitations for future facilities are found in Chapter 6, Water Quality and Regulatory Standards and Criteria.

Planning Period

The time period for wastewater facilities planning is typically 20 years, which is generally consistent with the design life of wastewater treatment facilities. For the Dallas plan, the planning period extends to the year 2020, which is 25 years beyond an approximate 1995 construction date for improvements to the WWTF.

Population and Land Use Projections

Population

Historical population for the City of Dallas is shown in Table 3-1. As reported in the City's Comprehensive Plan, the City's historical growth has been cyclical but steady. The 1940s and 1970s have been the highest growth decades, while the 1920s and 1950s have been the lowest growth decades. Growth since 1980 has been at a slower but steady pace. The City's growth has generally followed growth trends of the mid-Willamette Valley.

Projected population growth is presented in Table 3-2. The population projections are taken from the City's 1989 Water Supply Study, which presented growth through 2010. The projections in the 1989 study were based on the City's Comprehensive Plan projections prepared by Portland State University. The projected population growth from 1990 to 2020 is 1.37 percent per year. The projected growth rate is slower than that experienced between 1950 and 1990 (1.72 percent per year), but faster than the growth experienced in the 1980s (1.07 percent per year). Given the historical growth rates of the City and the continued and projected migration into Oregon as a whole, the projected population growth appears to be a reasonable estimate.

Figure 3-1 shows population growth since 1950 and projected growth through 2020. Growth in the 1990s is projected to occur at a rate similar to that of the 1980s. Growth beyond the year 2000 is projected to occur at a somewhat higher rate. For planning purposes, the number of wastewater collection system connections outside the City limits is assumed to be the same as the number of water system connections outside the City limits as identified in the 1989 Water Supply Study. The projected population for the year 2020 was estimated by using the same growth rate from 2000 to 2010 (8.367 percent every 5 years).

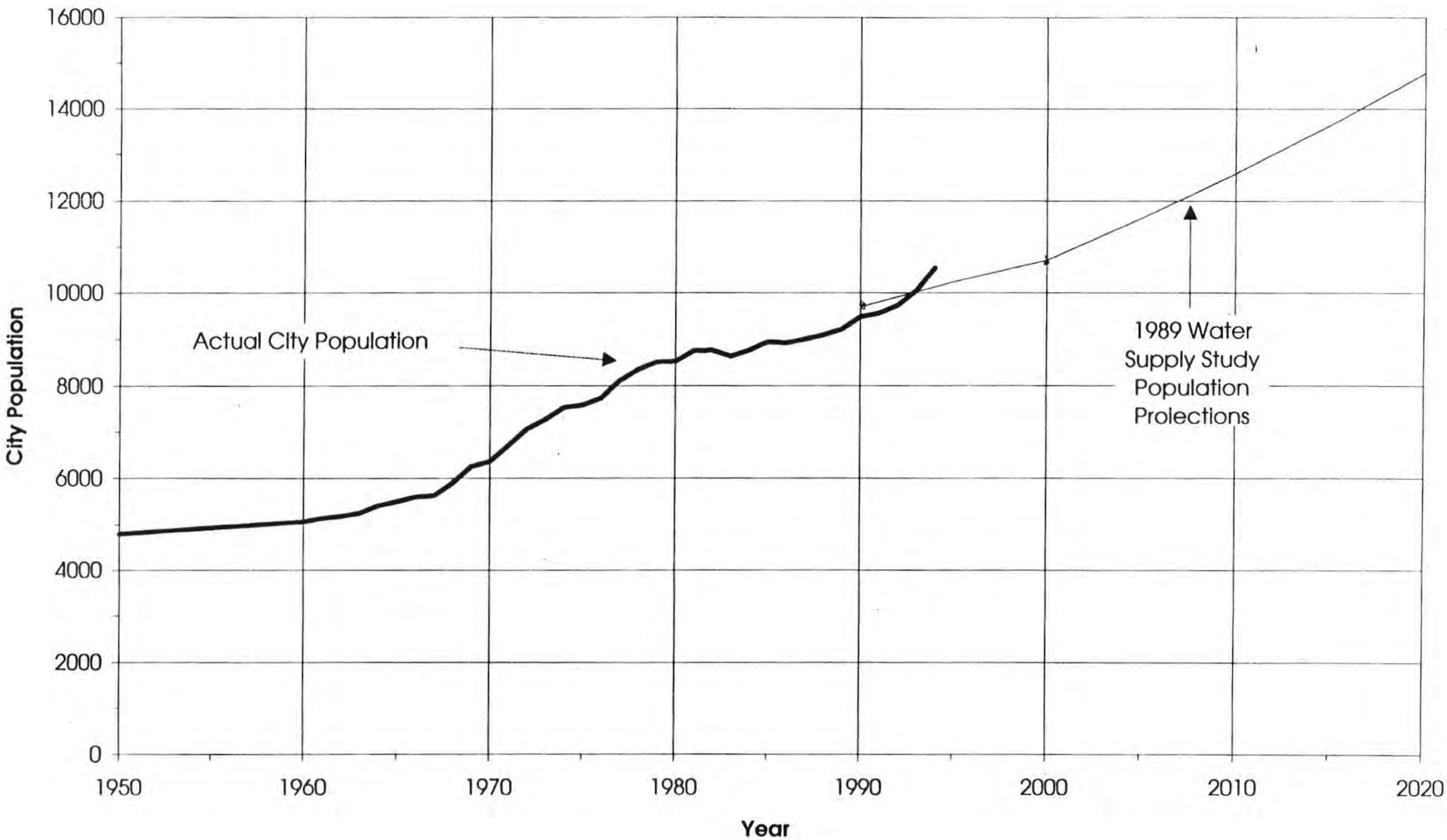
Table 3-1 City of Dallas Historical Population	
Year	**Population**
1910	2,124
1920	2,701
1930	2,975
1940	3,579
1950	4,793
1960	5,058
1970	6,361
1980	8,531
1981	8,760
1982	8,770
1983	8,641
1984	8,775
1985	8,950
1986	8,930
1987	9,005
1988	9,100
1989	9,220
1990	9,485
1991	9,560
1992	9,730
1993	10,045
1994	10,545
Source: Portland State University, Center for Population Research and Census	

Table 3-2 Projected Service Populations for Wastewater Collection and Treatment System				
Year	**Projected City Population[a]**	**Projected Number of Outside Services[b]**	**Projected Outside Service Population[c]**	**Projected Total Service Population**
1995	10,239	330	858	11,097
2000	10,717	310	806	11,523
2005	11,613	290	754	12,367
2010	12,585	270	702	13,287
2015	13,638	250	650	14,288
2020	14,779	230	598	15,377

[a] The 1995 to 2010 projections are from the February 1989 Water Supply Study. The 2020 projection is an extension of the growth projection for the years 2000 to 2010: 8.367 percent every 5 years (1.62 percent per year).

[b] Outside services are those wastewater system connections that are outside the city limits. The number of outside connections is assumed to be the same as the number of outside water system connections and is assumed to decrease as the city limit grows to include connections that are currently served outside the city limits.

[c] The household population of outside services is estimated at 2.6 persons per service, based on the Water Supply Study.



Note - Projected population for 2015 and 2020
is based on the projected yearly growth
rate from 2000 to 2010.

Figure 3-1
HISTORICAL AND PROJECTED CITY OF DALLAS POPULATION

Land Use

Land use within the urban growth boundary (UGB) of Dallas is dictated by the City urban growth program. As described in the City's Comprehensive Plan, the purpose of the urban growth program is to provide for an orderly and efficient transition from rural to urban land use.

The current UGB (shown in Figure 2-1) contains a total area of 3,884 acres and represents the likely limits to urban expansion to the year 2020. Residential, commercial, and industrial land is available within the UGB for future development. The City does not anticipate any significant future changes in land use percentages compared to current percentages. Therefore, for future projections, commercial and industrial growth is assumed to increase proportionally with population growth. With future growth, land will continue to be developed within the UGB in accordance with zoning requirements. The City will expand the wastewater collection system as necessary to serve the additional growth.

Future Wastewater Flows and Characteristics

Current and projected flows to the Dallas WWTF are shown in Table 3-3. Current flows are broken down by source based on historical WWTF flow data and flow monitoring (base sewage, groundwater infiltration, and rain-dependent infiltration and inflow). Wet weather flows include current estimates of bypassed flow.

Projected dry weather base sewage flows were calculated from population projections in Table 3-2 and a historical per capita base wastewater flow of 117 gallons per day (see discussion in Chapter 2, Existing Conditions). The historical per capita base wastewater flow is assumed to remain constant in the future to provide treatment capacity for industrial expansion. Thus, the percentage of total wastewater flow from industrial sources is assumed to remain constant over the planning period. Should industrial discharges grow at a slower rate than in the past, then the 117 gallons per day may be a conservative assumption.

Historical flow data were used to calculate existing dry weather groundwater infiltration (GWI) and rain-dependent infiltration and inflow (RDI/I). The current dry weather peaking factors for maximum month average daily flow (DWMMADF) and peak hourly flow rate are 1.56 and 3.75 to 1, respectively. All flow projections in Table 3-3 assume removal of I/I due to sewer rehabilitation (see Chapter 5, Infiltration/Inflow Evaluation, for details). Wet weather GWI was determined during flow monitoring. Future wet weather infiltration due to expansion of the sewer system is based on 600 gallons per day per future sewered acre. Future dry weather I/I is calculated as a percent of wet weather I/I based on the ratio of wet weather to dry weather GWI.

The CBOD and TSS load projections established in the August 1994 Facility Plan were based on plant historical data for 1988 through 1992. Because several years have passed since those data were analyzed, more recent data were reviewed to update the previous load projections. The new data covered the time period from August 1992 through July 1995. The data for historical CBOD and TSS loads are summarized in Table 3-4. The revised projections that are based on these new data are presented in Table 3-5.

Table 3-3
Projected Influent Wastewater Flows to the Dallas WWTF

Flow Category	Dry Weather Flows, mgd			Wet Weather Flows, mgd		
	DWADF	**DWMMADF**	**DWPIF**	**WWADF**	**WWMMADF**	**WWPIF**
Total Base Sewage	1.30	1.30	1.95	1.30	1.30	1.95
Existing GWI	0.30	0.30	0.30	1.13	1.13	1.13
Existing RDI/I	0.00	0.90	3.75	0.93	4.33	14.02
Future I/I	0.00	0.00	0.00	0.00	0.00	0.00
1995 Total Flow[a]	**1.60**	**2.50**	**6.00**	**3.36**	**6.76**	**17.10**
Total Base Sewage	1.35	1.35	2.03	1.35	1.35	2.03
Existing GWI	0.30	0.30	0.30	1.13	1.13	1.13
Existing RDI/I	0.00	0.73	3.04	0.75	3.51	11.36
Future I/I	0.05	0.05	0.05	0.19	0.19	0.19
2000 Total Flow	**1.70**	**2.43**	**5.42**	**3.42**	**6.18**	**14.71**
Total Base Sewage	1.44	1.44	2.16	1.44	1.44	2.16
Existing GWI	0.30	0.30	0.30	1.13	1.13	1.13
Existing RDI/I	0.00	0.73	3.04	0.75	3.51	11.36
Future I/I	0.10	0.10	0.10	0.39	0.39	0.39
2005 Total Flow	**1.84**	**2.57**	**5.60**	**3.71**	**6.46**	**15.03**
Total Base Sewage	1.55	1.55	2.33	1.55	1.55	2.33
Existing GWI	0.30	0.30	0.30	1.13	1.13	1.13
Existing RDI/I	0.00	0.73	3.04	0.75	3.51	11.36
Future I/I	0.15	0.15	0.15	0.58	0.58	0.58
2010 Total Flow	**2.00**	**2.73**	**5.82**	**4.01**	**6.77**	**15.39**
Total Base Sewage	1.66	1.66	2.49	1.66	1.66	2.49
Existing GWI	0.30	0.30	0.30	1.13	1.13	1.13
Existing RDI/I	0.00	0.73	3.04	0.75	3.51	11.36
Future I/I	0.20	0.20	0.20	0.77	0.77	0.77
2015 Total Flow	**2.16**	**2.89**	**6.03**	**4.31**	**7.07**	**15.75**
Total Base Sewage	1.79	1.79	2.69	1.79	1.79	2.69
Existing GWI	0.30	0.30	0.30	1.13	1.13	1.13
Existing RDI/I	0.00	0.73	3.04	0.75	3.51	11.36
Future I/I	0.26	0.26	0.26	0.96	0.96	0.96
2020 Total Flow	**2.35**	**3.07**	**6.28**	**4.64**	**7.39**	**16.13**

Notes:
(a) 1995 flows based on August 1994 to July 1992 data.

Dry Weather = May through October
Wet Weather = November through April
DWADF = Dry Weather Average Daily Flow
DWMMADF = Dry Weather Maximum Month Average Daily Flow
DWPIF = Dry Weather Peak Instantaneous Flow
WWADF = Wet Weather Average Daily Flow
WWMMADF = Wet Weather Maximum Month Average Daily Flow
WWPIF = Wet Weather Peak Instantaneous Flow
GWI = Groundwater Infiltration
RDI/I = Rain-dependent Infiltration and Inflow
I/I = Infiltration and Inflow

Table 3-4
Historical CBOD and TSS Loads and Concentrations

	Historical Loads for August 1992 Through July 1995				Historical Concentrations August 1992 Through July 1995			
CBOD	***92-93***	***93-94***	***94-95***	***92-95 Avg***	***92-93***	***93-94***	***94-95***	***92-95 Avg***
DWADF	1,640	1,718	2,035	1,798	127	148	150	141
DWMMADF	2,350	1,960	2,481	2,263	145	166	171	161
WWADF	1,881	1,996	1,964	1,947	77	92	61	77
WWMMADF	2,623	2,371	3,017	2,670	123	156	111	130
TSS	***92-93***	***93-94***	***94-95***	***92-95 Avg***	***92-93***	***93-94***	***94-95***	***92-95 Avg***
DWADF	1,324	1,613	2,081	1,673	105	139	154	133
DWMMADF	1,614	1,807	2,350	1,924	119	145	176	147
WWADF	1,604	2,279	2,512	2,132	64	105	77	82
WWMMADF	2,201	2,857	3,205	2,754	85	168	118	123

Table 3-5
Projected Influent Flow Characteristics

Year	Condition	Flow (mgd)	$CBOD_5$ (lb/d)	$CBOD_5$ (mg/L)	TSS (lb/d)	TSS (mg/L)	TKN (lb/d)	TKN (mg/L)	Amm-N (lb/d)	Amm-N (mg/L)	TP (lb/d)	TP (mg/L)
1995	DWADF	1.60	1,999	150	2,057	154	467	35	334	25	107	8
1995	DWMMADF	2.50	2,517	121	2,365	113	588	28	420	20	134	6
1995	WWADF	3.36	2,166	77	2,621	93	506	18	362	13	116	4
1995	WWMMADF	6.76	2,970	53	3,387	60	694	12	496	9	159	3
2000	DWADF	1.70	2,126	150	2,187	154	497	35	355	25	114	8
2000	DWMMADF	2.43	2,677	132	2,515	124	626	31	447	22	143	7
2000	WWADF	3.43	2,303	81	2,787	97	538	19	384	13	123	4
2000	WWMMADF	6.18	3,158	61	3,601	70	738	14	527	10	169	3
2005	DWADF	1.84	2,302	150	2,368	154	520	34	370	24	120	8
2005	DWMMADF	2.57	2,899	135	2,723	127	654	30	466	22	151	7
2005	WWADF	3.71	2,494	81	3,018	98	563	18	401	13	130	4
2005	WWMMADF	6.46	3,420	63	3,899	72	772	14	549	10	178	3
2010	DWADF	2.00	2,504	150	2,576	154	560	34	400	24	130	8
2010	DWMMADF	2.73	3,152	138	2,962	130	706	31	504	22	164	7
2010	WWADF	4.01	2,712	81	3,282	98	607	18	434	13	141	4
2010	WWMMADF	6.77	3,719	66	4,241	75	832	15	595	11	193	3
2015	DWADF	2.16	2,705	150	2,783	154	600	33	430	24	140	8
2015	DWMMADF	2.89	3,406	141	3,200	133	756	31	542	22	176	7
2015	WWADF	4.31	2,930	81	3,546	99	650	18	466	13	152	4
2015	WWMMADF	7.07	4,019	68	4,582	78	892	15	639	11	208	4
2020	DWADF	2.35	2,932	150	3,016	154	650	33	460	24	150	8
2020	DWMMADF	3.07	3,691	144	3,468	135	819	32	580	23	189	7
2020	WWADF	4.64	3,175	82	3,843	99	704	18	499	13	163	4
2020	WWMMADF	7.39	4,355	71	4,965	81	966	16	684	11	223	4

Notes:

CBOD and TSS

1. DWADF concentrations based on measured 1994-95 values.
2. WWADF loadings based on 1992-95 average WWADF/DWADF loading ratios of 1.08 and 1.27 for CBOD and TSS, respectively.
3. DWMMADF loadings based on 1992-95 average DWMMADF/DWADF loading ratios of 1.26 and 1.15 for CBOD and TSS, respectively.
4. WWMMADF loadings based on 1992-95 average WWMMADF/WWADF loading ratios of 1.49 and 1.65 for CBOD and TSS, respectively.

Nutrients

4. DWADF TKN based on textbook value of 35 mg/L (Ref. MOP 8, WEF/ASCE).
5. DWADF Amm-N based on textbook value of 25 mg/L (Ref. MOP 8, WEF/ASCE).
6. DWADF TP based on textbook value of 8 mg/L(Ref. MOP 8, WEF/ASCE).
7. TKN, Amm-N, and TP for other conditions based on the DWADF ratio to BOD.

Dry Weather = May through October
Wet Weather = November through April
DWADF = Dry Weather Average Daily Flow
DWMMADF = Dry Weather Maximum Month Average Daily Flow
WWADF = Wet Weather Average Daily Flow
WWMMADF = Wet Weather Maximum Month Average Daily Flow

The average 1994/1995 summer concentrations of CBOD (150 mg/L) and TSS (154 mg/L) were used to project the DWADF loads. The remaining load conditions for DWMMADF, WWADF, and WWMMADF were calculated using the ratio of each to the DWADF for the average 1992 to 1995 data. No allowance has been included for a new high-BOD-strength industrial discharge (e.g., cannery).

Because of the limited amount of existing plant nutrient data, typical values reported in the literature for municipal wastewaters (Design of Municipal Wastewater Treatment Plants, MOP 8, WEF/ASCE) of 35 mg/L total nitrogen, 25 mg/L ammonia, and 8 mg/L total phosphorus were used for 1995 projections. Nutrient loadings projected beyond 1995 are based on the BOD projections and the mass ratios of BOD to the respective nutrients for 1995. The projected nutrient loadings may be adjusted during design based on additional WWTF data.

Chapter 4
Rickreall Creek Water Quality and Toxicity Analysis

CHAPTER 4

RICKREALL CREEK WATER QUALITY AND TOXICITY ANALYSIS

Introduction

This chapter describes the analysis associated with the water quality modeling and toxicity analysis for Rickreall Creek. Included in this chapter are sections discussing the background of water quality in Rickreall Creek, the water quality modeling effort, the toxicity analysis, and the development of proposed mass loads.

Background

Rickreall Creek is a tributary of the Willamette River and thus the water quality criteria for Rickreall Creek are determined based on the Willamette Basin standards as defined in OAR Chapter 340, Division 41. The Willamette Basin water quality standards are summarized in Chapter 6. At the time the August 1994 facility plan study was initiated, Rickreall Creek was classified as a non-salmonid fish producing water; this classification defines the water quality based minimum standards that need to be maintained. However, during the initial study process in January 1993, DEQ reclassified the stream as a salmonid fish producing water based on information from the Oregon Department of Fish and Wildlife (ODFW) that fish habitat existed immediately downstream of the existing Dallas outfall discharge point. Therefore, the modeling effort conducted in the August 1994 facility planning effort was based on the more stringent water quality standards for the salmonid stream classification.

The modeling effort conducted in 1993 that was based on the salmonid classification resulted in a finding that no discharge could be permitted in the summertime and winter discharge was acceptable but only at certain minimum stream flows. Because of these limitations, the 1994 Facility Plan concluded that a pipeline for discharge to the Willamette River was significantly less costly than the options involving discharge to Rickreall Creek with irrigation for periods when no discharge is allowed. During public and agency review of the 1994 Facility Plan, significant concerns were raised regarding impacts to fisheries and other beneficial uses resulting from removal of the effluent from Rickreall Creek, particularly during low flow periods.

After further review of the stream's characteristics and the possible impacts of removing the effluent during low flow periods, and because of proposed water quality regulation changes, particularly those involving how streams are classified, the ODF&W recommended that the reach of Rickreall Creek from the existing WWTF to the confluence with the Willamette River should be reclassified as non-salmonid. More specifically, DEQ has suggested that this reach of Rickreall Creek should be governed by the "cool water" classification that was adopted as part of the recent water quality rule changes. Because of this reclassification and significant opposition to the Willamette River pipeline alternative, the City has chosen to re-evaluate the 1994 Facility Plan findings and remodel Rickreall Creek to determine the impact the reclassification has on the Facility Plan findings.

Because of new water quality based standards and the fact that Rickreall Creek has been identified as a water quality limited stream, a water quality analysis of the stream to evaluate the impacts of waste loads on the stream was required to determine the potential for continued discharge. The purpose of the water quality analysis was to establish mass loads for discharge to Rickreall Creek that would allow water quality criteria to be met. From these proposed mass loads, waste load allocations (WLA) can be determined for the discharges to the stream. The WLAs are set so that the stream water quality is maintained at or above the minimum criteria for the highest and best possible use.

Data Collection and Field Studies

Historical streamflow and water quality data were collected and assembled for Rickreall Creek from the USGS, Oregon Department of Environmental Quality (ODEQ), Oregon Department of Water Resources (ODWR), City of Dallas, and National Weather Service (NWS). The ODEQ performed field surveys for stream cross sections and hydraulics in April 1992 and collected grab samples for water quality analysis in both April and October 1992. The 1992 field data results were provided by ODEQ along with analytical water quality information. The City of Dallas provided WWTF effluent flow and water quality data from the existing plant to characterize the discharge. Previous mixing zone studies in 1988 and 1989 were obtained from ODEQ that included descriptions of the effluent water quality and river quality.

As part of the task to remodel Rickreall Creek and to evaluate toxicity concerns, a supplemental data collection effort was undertaken by the City during the summer of 1995 to better characterize the WWTF effluent, the stream, and its tributaries. This was not an exhaustive data collection effort, as time and costs limited the amount of data collected. In addition to the City's effort, DEQ performed sediment oxygen demand tests on Rickreall Creek during October of 1995.

The original field data collected for Rickreall Creek as part of the studies described above illustrated that water quality standards were being violated both upstream and downstream of the Dallas WWTF discharge. In particular, the limit for fecal coliform bacteria levels exceeded the instream standard both upstream and downstream of the plant discharge. Dissolved oxygen was also found to be below the standard of 90 percent saturation during certain times of the day for the salmonid classification, which was subsequently modified. Downstream of the WWTF discharge, nutrients including phosphorus and nitrogen are considered to be a problem. In addition, the mixing zone studies indicated that effluent toxicity resulting from high chlorine residual and poor mixing results in violation of water quality criteria. Low stream flows during the summer contribute to the problem of poor mixing and the inability of the existing Dallas discharge to meet the state's dilution rule [see OAR 340-41-455-(1)-(f)].

The Dallas WWTF discharge is the only permitted point source in Rickreall Creek; however, other sources of pollution contribute significantly to the water quality problems in Rickreall Creek. Much of the drainage area of Rickreall Creek runs through agricultural land so it is anticipated that runoff from these lands exerts a significant demand on the stream. Basket and Hayden sloughs feed Rickreall Creek and both drain large agricultural areas. In addition to the agricultural runoff, septic tanks in the unsewered areas are suspected of contributing to the water quality issues.

Historic Stream Flows

Rickreall Creek flows have not been closely monitored over the years, although the USGS maintained a gauge station at river mile 19.1 from 1961 to 1978. Gauge Station No. 14190700 is approximately 9 miles upstream of the Dallas WWTF. Because significant additional flows may occur between the gauge station site and the municipal discharge location, the USGS developed a regression equation for extrapolating flows from gauged streams to ungauged streams in western Oregon. From this equation, and from estimates of additional basin area, stream slope, and other factors, a multiplier of 1.5 was developed to extrapolate monthly average flows at the gauge to monthly average flows directly upstream of the treatment plant discharge. The monthly mean and 7Q10 flows for Rickreall Creek at the existing WWTF discharge presented in Table 4-1 were developed based on the gauge station flows multiplied by the 1.5 factor. The 7Q10 flows are used to evaluate the effects of the discharge on the stream under low flow conditions. The waste load allocations are developed so that water quality is maintained at the 7Q10 stream flows.

Table 4-1
Estimated Rickreall Creek Stream Flows (cfs)
at Existing WWTF Discharge[a]

Month	Mean	7Q10
January	596	80
February	410	70
March	374	78
April	179	41
May	92	29
June	33	10.9
July	11.3	3.7
August	7.2	1.4
September	9.9	1.7
October	44	2.5
November	315	13.1
December	567	52

[a] Estimated Rickreall Creek flows at WWTF based on a factor of 1.5 times the flows at Gauge Station No. 14190700.

Meteorological Data

The climatological data used to define seasonal weather conditions on an average monthly basis were developed from weather data acquired from the Class A weather station at the Salem, Oregon, airport for 1992, and average solar radiation data for Salem. The meteorological data provide air temperatures and information for determining the water temperatures occurring in the stream.

Dallas WWTF Effluent Quality and Quantity

The stream modeling and toxicity analysis were conducted using preliminary projections of wastewater flows of 3.07 mgd and 7.39 mgd, which are dry weather and wet weather maximum month average day flows, respectively. The flow projections are shown in Chapter 3, Future Conditions. These flows are anticipated to occur in the year 2020. The current dry weather and wet weather average day flows are 1.6 and 3.4 mgd, respectively.

The stream modeling and toxicity analysis were performed using five different levels of treatment quality that represent five different treatment systems. The five treatment systems include: 1) advanced biological treatment (i.e. nitrification and denitrification), 2) advanced biological treatment with filtration, 3) advanced biological and chemical treatment with filtration, 4) conventional biological treatment with wetlands polishing, and 5) best available technology.

The treatment components and anticipated effluent quality for each of the five systems is presented in Table 4-2. The anticipated effluent qualities shown were developed from estimates of the influent qualities of the existing Dallas wastewater based on limited data, and performance data (Fate of Priority Pollutants in Publicly Owned Treatment Works, EPA, 1982, and CH2M HILL Toxics Database) of anticipated treatment removal efficiencies for similar systems for the different processes considered. For alternatives 1, 2, 3 and 5, the effluent qualities are generally considered 90 percent confidence values and for alternative 4, the values are generally considered 75 percent confidence level. The wetlands option has a lower level of confidence in meeting the criteria because it is more difficult to control or predict effluent quality from a wetland.

Water Quality Modeling

The USEPA water quality model QUAL2E was used to analyze the influence of the Dallas WWTF treated effluent discharge on Rickreall Creek. The previous data collected plus the data collected in 1995 were used in developing the model. Where data were not available or were questionable, default values or values recommended by the EPA Center for Exposure Assessment Modeling were used.

The model was used to evaluate compliance with the water quality criteria summarized in Chapter 6. The specific criteria evaluated in the model included dissolved oxygen, chlorophyll-a, temperature, turbidity, and total dissolved solids (TDS). In summary, the water quality criteria/guidance for the proposed cool water stream classification are as shown in Table 4-3.

Table 4-3
Proposed Rickreall Creek In-stream Water Quality Criteria/Guidance for Cool Water Designation

Parameter	Proposed In-stream Criteria/Guidance
Temperature[a]	< 64° F
DO	> 6.5 mg/L
TDS	<100 mg/L
Turbidity	< Background plus 10 percent
Chlorophyll-a	< 15 µg/L

[a] No measurable increase in stream temperature.

Table 4-2
City of Dallas
Anticipated Effluent Quality for Proposed Treatment Alternatives

Treatment Unit Processes

Alt. No.	Alternative Description	Season	Conv Sec Trtmnt	Adv Sec Trtmnt	Wetlands	Alkalinity Adjustment	Tert Chem Trtmnt	Filtration	Chlorine Disinfection	Dechlorination	MF/RO	Cooling Towers	Post Aeration
1	Advanced biological treatment	Summer	x			x			x	x			x
1	Advanced biological treatment	Winter	x			x			x	x			x
2	Advanced biological treatment w/Filtration	Summer		x		x		x	x	x		x	x
2	Advanced biological treatment w/Filtration	Winter		x		x		x	x	x		x	x
3	Advanced biological/chemical treatment w/filtration	Summer		x		x	x	x	x	x			x
3	Advanced biological/chemical treatment w/filtration	Winter		x		x	x	x	x	x			x
4	Conventinal biological treatment w/wetlands	Summer	x		x				x				x
4	Conventinal biological treatment w/wetlands	Winter	x		x				x				x
5	Treatment for year-round Rickreall discharge	Summer		x		x	x	x	x	x	x	x	x
5	Treatment for year-round Rickreall discharge	Winter		x		x	x	x	x	x	x	x	x

Anticipated Effluent Quality, (mg/L or as noted)

Alt. No.	Alternative Description	Season	$CBOD_5$	TSS	NH4	NO2+3	TKN	TN	TP	Ortho P	Temp oC	DO	TDS	pH	Turbidity, NTU	FC, MPN/100 ml
1	Advanced biological treatment	Summer	10	10	1	3	4	7	5.0	4.5	22	7.0	362	7.0	5	60
1	Advanced biological treatment	Winter	20	20	2	5	7	12	2.5	2.2	15	8.5	237	7.0	10	60
2	Advanced biological treatment w/Filtration	Summer	5	5	1	3	3	6	4.5	4.0	22	7.0	300	7.0	2	60
2	Advanced biological treatment w/Filtration	Winter	10	10	2	5	6	11	2.3	2.0	15	8.5	200	7.0	5	60
3	Advanced biological/chemical treatment w/filtration	Summer	5	5	1	3	2	5	0.5	0.4	22	7.0	300	7.0	2	60
3	Advanced biological/chemical treatment w/filtration	Winter	5	5	2	5	4	9	0.5	0.4	15	8.5	200	7.0	2	60
4	Conventinal biological treatment w/wetlands	Summer	6	7	2	1	3	4	0.5	0.3	19	8.0	375	6.7	6	60
4	Conventinal biological treatment w/wetlands	Winter	8	8	5	2	6	8	0.5	0.3	9	10.0	200	6.3	7	60
5	Treatment for year-round Rickreall discharge	Summer	1	1	1	2	1	3	0.3	0.3	#	7.0	100	6.5	1	30
5	Treatment for year-round Rickreall discharge	Winter	1	1	2	3	2	5	0.3	0.3	#	8.5	100	6.5	1	30

Dissolved Metals, ug/L

Alt. No.	Alternative Description	Season	Arsenic	Cadmium	Total Chromium	Copper	Iron	Lead	Mercury	Nickel	Silver	Zinc
1	Advanced biological treatment	Summer	1.9	5.9	1.4	203	1100	6	0.0005	67	1.6	81
1	Advanced biological treatment	Winter	1.0	3	0.7	102	550	3	0.000250	34	0.8	41
2	Advanced biological treatment w/Filtration	Summer	0.38	0.8	1.24	109	300	3	0.000100	18	0.3	25
2	Advanced biological treatment w/Filtration	Winter	0.19	0.4	0.62	55	150	2	0.000050	9	0.2	12
3	Advanced biological/chemical treatment w/filtration	Summer	0.19	0.4	0.62	55	150	2	0.000050	9	0.2	17
3	Advanced biological/chemical treatment w/filtration	Winter	0.10	0.2	0.31	27	75	1	0.000025	5	0.1	9
4	Conventinal biological treatment w/wetlands	Summer	1.14	3.5	0.84	122	440	2	0.000300	40	1	49
4	Conventinal biological treatment w/wetlands	Winter	0.57	1.8	0.42	61	220	1	0.000150	20	0.5	24
5	Treatment for year-round Rickreall discharge	Summer	0.03	0.1	0.11	10	27.5	0	0.000009	1.7	0	3.2
5	Treatment for year-round Rickreall discharge	Winter	0.03	0.1	0.11	10	27.5	0	0.000009	1.7	0.0	3.2

Notes:
\# Equal to back ground stream temperature

The model was run for five different scenarios. The first scenario was a no discharge case used to evaluate conditions in the stream if the City discontinues discharge. The other four scenarios involved the first four treatment systems and anticipated effluent qualities shown in Table 4-2. The fifth treatment alternative was not modeled because the effluent parameters established for this alternative meet all the in-stream water quality criteria/guidelines.

Because of the different seasonal conditions of the stream quality, weather characteristics, and effluent quantity/quality, the model was run for each of the five scenarios under seven different seasonal conditions. The seven seasons and associated seasonal conditions modeled are presented in Table 4-4.

Table 4-4
WWTF Effluent and Rickreall Creek Water Quality Evaluation Conditions

Month	WWTF Discharge[a]	Temperature	Other Water Quality Data[b]	Rickreall Creek and Basin Water Quality Data
April	WWADF	Average Winter and Summer	Average Winter and Summer	Spring
May	DWMMADF	Average Winter and Summer	Summer	Spring
June	DWADF	Summer	Summer	Summer
July-September (Summer)	DWADF	Summer	Summer	Summer
October	DWADF	Average Winter and Summer	Summer	Fall
November	WWADF	Winter	Winter	Winter
December-March (Winter)	WWMMADF	Winter	Winter	Winter

[a] WWADF = Wet Weather Average Daily Flow
WWMMADF = Wet Weather Maximum Month Average Daily Flow
DWADF = Dry Weather Average Daily Flow
DWMMADF = Maximum Month Average Daily Flow

[b] Background Rickreall Creek, tributaries, nonpoint source, and sloughs water quality were defined on a seasonal basis (fall, winter, spring, summer) as data were available.

In the previous modeling effort, dissolved oxygen was the primary focus because under the salmonid classification the DO criterion was much more difficult to achieve. With the new cool water DO target criterion of 6.5 mg/L, DO is no longer the limiting criterion. In fact, the DO criterion is met for all seasonal conditions for all five alternatives.

In the case of chlorophyll-a, DEQ has established 15 µg/L as a target level for stream quality as a trigger to establish when action may need to be taken to reduce nutrient loads to a stream. The nutrient loads may come from both point and nonpoint sources (i.e., agricultural runoff). The model results for chlorophyll-a showed that for alternatives 1, 2, and 4, the target concentration was exceeded only during the summer period (i.e., July through September). The actual values estimated were less than 20 µg/L and occurred in the last 1.5-mile stream segment prior to the confluence with the Willamette River. Because of the other nonpoint sources of loads in the stream segment from the WWTF to the Willamette, the chlorophyll-a levels are not solely attributable to the WWTF discharge. No exceedance was recorded for Alternative 4. Because of the effluent quality parameters established for Alternative 5, it was concluded that the target level would be achieved for Alternative 5. Given the conservative assumption of stream flows used in the modeling, nutrients from the WWTF do not appear to indicate impairment of the stream's water quality and associated beneficial uses, even with the lowest level of treatment. Therefore, no additional removal of nutrients is considered necessary beyond the levels achieved in the treatment systems considered.

Based on the recent amendments to the state water quality regulations (OAR 340-41), the criterion for temperature for Rickreall Creek is that above 64°F, there is to be no measurable increase in temperature as the result of the WWTF discharge. Data collected on stream temperature show that Rickreall Creek water temperature exceeds the 64°F value during June through September, even above the existing WWTF discharge. The modeling effort shows that downstream temperature increases for alternatives 1 through 4 as the result of the WWTF discharge during the months of July through September. However, the model also shows that when the stream is modeled without the WWTF discharge, the resulting downstream water temperature is higher than if the WWTF discharge is present. Based on this finding, it was concluded that the stream's water quality is actually better with the WWTF discharge than without (i.e., less impairment of beneficial uses). For Alternative 5, chillers were included in the flow stream to adjust effluent temperature to match stream temperature; therefore, although the stream temperature exceeds the criteria, this alternative results in no further increase in stream temperature.

The established water quality guideline for total dissolved solids (TDS) for the Willamette Basin and Rickreall Creek is 100 mg/L. Based on data collected during the development of this plan, the TDS of the creek upstream of the existing WWTF discharge varies between about 80 to 130 mg/L. Therefore, even the background condition often exceeds the currently established guideline for streams in the basin.

Because the upstream concentration generally exceeds the guideline and because the effluent TDS concentration is about 2 to 3 times higher in concentration than background, it can be concluded that the downstream TDS concentrations will generally exceed the established guideline. The modeling predicts that TDS concentrations will be within the guideline during the winter period (December through March).

During the remainder of the year, the model predicts that the stream's TDS concentration is generally less than 180 mg/L, except during the lowest summer creek flows (July through September) when the concentration may be as high as 200 to 300 mg/L, depending on the treatment alternative considered. At these concentrations, no significant impairment to the stream's beneficial uses is anticipated.

For turbidity, no more than a 10 percent cumulative increase in natural stream turbidity shall be allowed. The background stream turbidity varies substantially, depending on the seasonal conditions and flow in the creek. Values measured in the summer at relatively low flows varied between 1 and 4 NTUs. Winter (high flow) turbidities are anticipated to be substantially higher. Based on the anticipated effluent turbidities for the treatment alternatives, there will be no discernable change in turbidity as a result of Dallas' effluent discharge. Given the relative clarity of both the stream and the anticipated effluent, no impairment to the stream's beneficial uses is expected.

Proposed Mass Loads

The proposed mass loads for Rickreall Creek are based on a level of treatment equal to or greater than Alternative 2, advanced biological treatment with filtration. The mass loads were established based on meeting the dissolved oxygen criteria at all times. Because of the issues discussed previously for chlorophyll-a, temperature, turbidity, and TDS, specific concentration or mass load limits are not proposed for these constituents.

The proposed mass loads reflect several changes from the current Dallas WWTF mass loads. The current mass loads only consider $CBOD_5$ and TSS and do not take into account ammonia (NH_3-N). The proposed mass loads consider all three because ammonia has a significant impact on the dissolved oxygen demand. The proposed mass loads are also based on the new criteria for cool water (see Amendments to OAR 340-41) that have been adopted and that have been identified as the classification for this reach of Rickreall Creek. Because these mass loads are in excess of the current mass loads, approval by the Environmental Quality Commission (EQC) through the appropriate procedures as outlined in OAR Chapter 340, Division 41, Section 026 is anticipated to be required.

Although the modeling was conducted for seven different seasons, the mass loads have been simplified into two seasons, summer and winter (i.e. dry weather and wet weather, respectively), as is commonly practiced in Western Oregon. The proposed mass loads for summer and winter are discussed in the following sections.

Summer Mass Loads

The summer time period is defined as May 1 through October 31. The model indicated that the DO criteria could be met when the stream flow is above 1.5 cfs and the mass loads and concentrations shown in the top half of Table 4-5 are achieved. The stream flow of 1.5 cfs is equivalent to the lowest summer 7Q10 flow. When the stream flow is twice this value or 3 cfs, the water quality criteria may be met at the mass loads and concentrations shown in the bottom half of Table 4-5, which for $CBOD_5$ and TSS are equivalent to the summertime basin standard. All of the concentrations shown in Table 4-5 are based on the projected dry weather maximum month WWTF flow of 3.07 mgd.

Winter Mass Loads

The winter time period is defined as November 1 through April 30. The model indicated that the DO criteria could be met when the stream flow is above 13 cfs and the mass loads and concentrations shown in the top half of Table 4-6 are achieved. The stream flow of 13 cfs is equivalent to the lowest winter 7Q10 flow. When the stream flow is twice this value or 26 cfs, the water quality criteria may be met at the mass loads and concentrations shown in the bottom half of Table 4-6, which for $CBOD_5$ and TSS are equivalent to the wintertime basin standards. All of the concentrations shown in Table 4-6 are based on the projected wet weather maximum month WWTF flow of 7.39 mgd.

Toxicity Analysis

Another key water quality criteria involves discharge of toxic substances. Toxic substances are not to be discharged in amounts above background concentrations that can be harmful to biological life or adversely affect the stream's beneficial uses. To evaluate the Dallas

Table 4-5
City of Dallas WWTF
Proposed Discharge Criteria and Mass Load Limits for Rickreall Creek
Summer (May 1 - October 31)

Parameters	Average Effluent Concentrations*		Proposed Mass Load Limitations		
	Monthly mg/L	Weekly mg/L	Monthly Average lb/day	Weekly Average lb/day	Daily Maximum lb/day
May 1 - October 31 with streamflow <3 cfs					
$CBOD_5$	5	7.5	130	190	260
TSS	5	7.5	130	190	260
NH_3-N	1	1.5	25	38	50
FC/100 mL	200	400			
May 1 - October 31 with streamflow>3 cfs					
$CBOD_5$	10	15	260	380	520
TSS	10	15	260	380	520
NH_3-N	2	3	51	77	102
FC/100 mL	200	400			

* The average effluent concentrations are based on the projected dry weather maximum month treatment plant capacity of 3.07 mgd.

Table 4-6
City of Dallas WWTF
Proposed Discharge Criteria and Mass Load Limits for Rickreall Creek
Winter (November 1 - April 30)

Parameters	Average Effluent Concentrations*		Proposed Mass Load Limitations		
	Monthly mg/L	Weekly mg/L	Monthly Average lb/day	Weekly Average lb/day	Daily Maximum lb/day
November 1 - April 30 with streamflow <26 cfs					
$CBOD_5$	10	15	620	930	1,230
TSS	10	15	620	930	1,230
NH_3-N	2	3	123	185	250
FC/100 mL	200	400			
November 1 - April 30 with streamflow > 26 cfs					
$CBOD_5$	25	40	1,540	2,470	3,080
TSS	30	45	1,850	2,770	3,700
NH_3-N	10	15	615	920	1,230
FC/100 mL	200	400			

* The effluent concentrations are based on the projected wet weather maximum month treatment plant capacity of 7.39 mgd.

effluent discharge for toxic substances, a toxicity analysis was performed that included background and effluent sampling, a dilution analysis, and calculation of effluent limits.

Data and Assumptions

The allowable water quality limits for toxic substances were obtained for the analysis from OAR 340-41, Table 20. For constituents with no value listed in Table 20, the default values provided in the EPA Region 10 Water Quality Spreadsheet model were used. The acute and chronic water quality limits for the substances of concern are presented in Table 4-7 along with the existing effluent concentrations estimated based on limited data. Where measured values are not given, the substance was not detected. For substances that were not detected, the analysis was performed with a value equal to half of the detection (reporting) limit.

The toxicity of some substances vary with water hardness. A value of 30 mg/L was used for all calculations that was based on measured magnesium concentration, and is consistent with values for other streams in the Willamette Basin.

Values for stream flow were based on the 7Q10 flows presented in Table 4-1. The effluent flows for the WWTF were based on the projected flows in Table 3-3. It was initially assumed that 50 percent of the 7Q10 flow and 25 percent of the 1Q10 flow in Rickreall Creek was available for dilution, and that metals loading did not vary with increases in WWTF flow. The assumption that metals loading remains constant postulates that the majority of metals loading comes from sources that do not vary by season. This assumption appeared to be validated based on limited data collected during dry and wet weather.

Table 4-7
Ambient Water Quality Criteria

Compound	Estimated Existing Effluent Concentration* (µg/L)	Ambient Water Quality Criteria (µg/L)	
		Acute	Chronic
Arsenic III	1.9	360	190
Cadmium	5	3.9	1.1
Total Chromium	5.9	1,000.32	128.32
Copper	203	18	12
Cyanide	5	22	5.2
Iron	1,100	2,000	1,000
Lead	6	82	3.2
Mercury	0.00005	2.4	0.012
Nickel	67.1	1,400	160
Silver	1.6	4.1	0.12
Zinc	81.1	120	110

* Estimated based on limited data.

As in the water quality modeling effort, five different treatment alternatives (see Table 4-2) were considered in the analysis. The estimated effluent metals concentrations for the five alternatives shown in Table 4-2 were developed from literature values for removal efficiencies from the processes considered, comparison to removal through the existing WWTF, and from experience with other facilities.

Dilution Analysis

As an initial evaluation of toxicity, a dilution analysis was performed to estimate the stream flow required to meet the chronic ambient water quality criteria presented in Table 4-7. The stream flows calculated are based on the estimated effluent quality for each of the five alternatives and account for dilution only; they do not predict whether or not the dilution could be achieved within a specified mixing zone. The calculated stream flows required are shown in Table 4-8.

Table 4-8
Stream Flow Required to Meet Water Quality Standards in Rickreall Creek[a]

	Minimum Required Flow in Rickreall Creek (cfs)					
Compound	**Existing WWTF[b]**	**Alternative 1**	**Alternative 2**	**Alternative 3**	**Alternative 4**	**Alternative 5**
Arsenic III	<1	<1	<1	<1	<1	<1
Cadmium	21	25	3	2	15	1
Total Chromium	<1	<1	<1	<1	<1	<1
Copper	80	80	43	22	48	8
Cyanide	5	<1	<1	<1	<1	<1
Iron	5	5	<1	<1	<1	<1
Lead	9	9	4	3	3	1
Mercury	<1	<1	<1	<1	<1	<1
Nickel	2	2	<1	<1	1	<1
Silver	63	63	12	8	39	4
Zinc	3	3	1	1	2	<1

[a] Assumes 50 percent of 7Q10 and 25 percent of 1Q10 stream flow are available for mixing.
[b] Combined domestic and industrial wastewater.

The stream flows required to meet the chronic standard decrease as the level of removal increases. Given the assumptions used in this analysis, discharge to Rickreall Creek would be restricted during the months when the stream flow is less than the required flow for mixing. Several metals, including cadmium, copper, lead, silver, and zinc, appear to require more stream flow than is available for many of the months, although copper appears to require the greatest flow. This analysis indicates that, given the current waste characteristics, discharge to Rickreall Creek would be significantly restricted unless very high levels of treatment are implemented (i.e. best available technology—Alternative 5), or if the influent characteristics can be modified by separating the industrial flow. Because of this finding, a more definitive effluent concentration limit analysis was performed.

Effluent Concentration Limit Analysis

Effluent concentration limits are typically lower than the concentrations that result in nominal compliance based only on dilution because effluent concentration limits are based on statistical procedures to ensure compliance at all times, given that variability in effluent concentrations will occur. The EPA Region 10 water quality spreadsheet model was used to determine the allowable daily maximum effluent concentration for various metals. The maximum allowable effluent concentration is based on the most limiting condition. In most cases, the chronic criterion controls, but in some cases, the acute standard may control.

The effluent concentration limits for the various metals shown in Table 4-9 represent 95 percent confidence level values. Table 4-9 includes three flow cases that represent a summer, spring/fall, and winter condition. The corresponding stream flows used for these three cases were 2.5, 17.5, and 58.5 cfs, respectively. Comparing these effluent limits to the anticipated effluent concentrations, the months when discharge is or is not possible may be determined. Because copper appears to be the most restrictive of the metals, a more detailed analysis was performed for copper.

Table 4-9
Dallas WWTF Estimated Effluent Limits (Daily Maximum Concentration, µg/L)[a]

		Estimated Effluent Limits[b]		
Compound	**Estimated Existing Effluent Concentration[c] (µg/L)**	**Low Flow (Summer)**	**Medium Flow (Spring/Fall)**	**High Flow (Winter)**
Arsenic III	1.9	285	449	698
Cadmium	5	1.66	3.52	6.28
Total Chromium	5.8	194	410	733
Copper	203	14.2	22.5	34.9
Cyanide	5	7.87	16.6	29.7
Iron	1100	1512	2496	3880
Lead	6	4.84	10.2	18.3
Mercury	0.00005	0.018	.038	.069
Nickel	67.1	242	512	914
Silver	1.6	0.182	0.384	0.685
Zinc	81.1	94.9	150	233

[a] Based on analysis using the EPA spreadsheet assuming 50 percent of the 7Q10 and 25 percent of the 1Q10 stream flows for mixing.

[b] The three seasonal conditions analyzed were based on the following WWTF and stream flows:

	Summer	Spring/Fall	Winter
WWTF (mgd)	2.35	3.07	4.64
Stream 7Q10 flow (cfs)	2.5	17.5	58.5

[c] Combined domestic and industrial wastewater.

By running the EPA model at various plant flows, a set of curves was developed that represents the effluent copper concentration that may be discharged at various stream flows at a given plant flow. Figure 4-1 shows a plot of a set of curves for copper. By comparing the effluent copper concentration obtained from these curves against the anticipated effluent copper concentration for the treatment alternatives, the months when discharge is feasible may be determined. The results of this analysis for the existing influent characteristics reveals that only Alternatives 3 and 5 would result in an effluent quality that would allow discharge to Rickreall Creek (see Figure 4-2). For Alternative 3, only the high stream flow winter months would permit discharge. Alternative 5 could permit discharge most of the year.

Figure 4-1
Allowable Effluent Copper Concentration vs Stream Flow for Various Plan Flows - Assumes 50% of 7Q10 Stream Flow Available for Mixing and 6 ug/L Background Copper Concentration

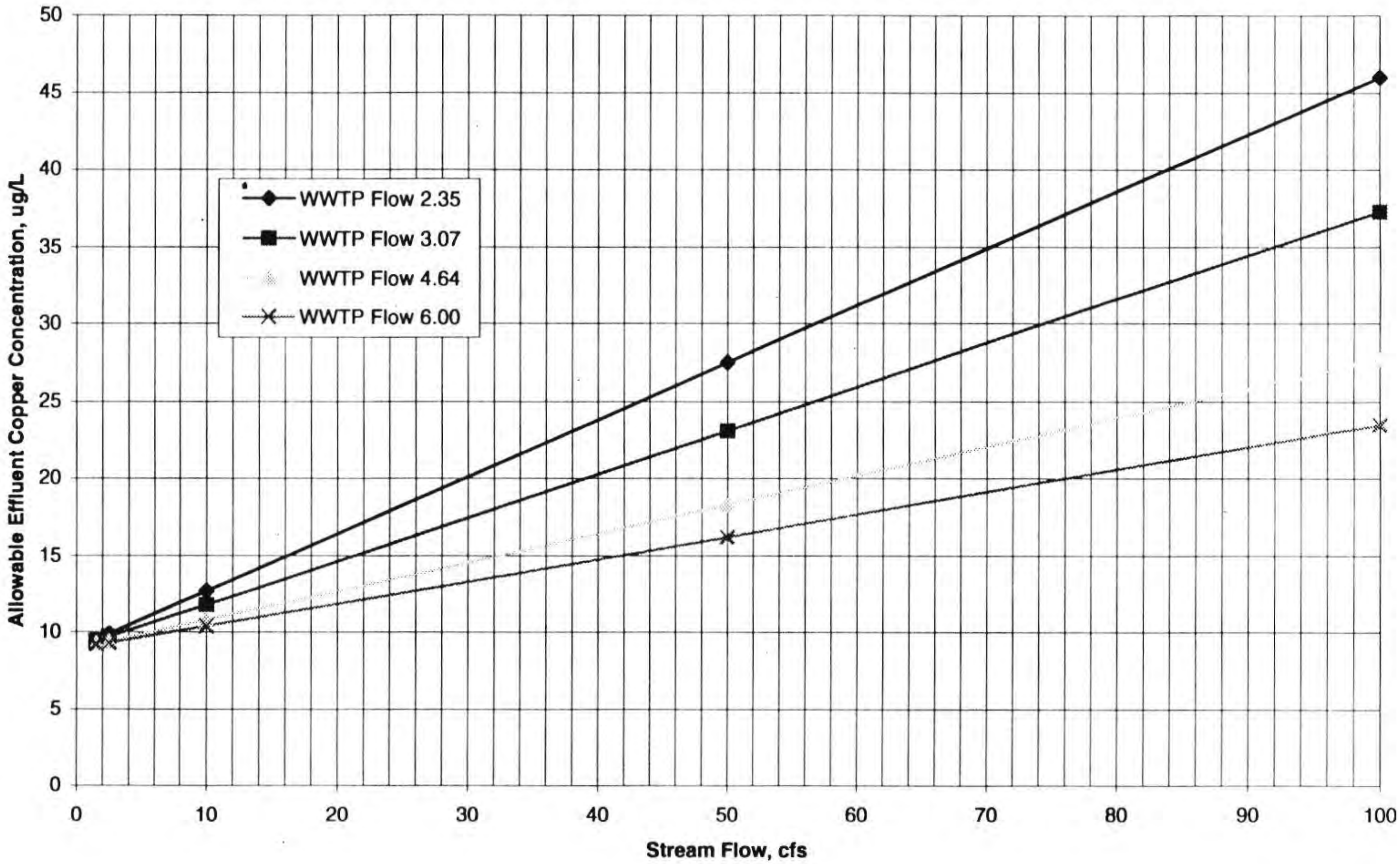


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Figure 4-2
Comparison of Effluent Metals vs Predicted Effluent Criteria for Combined Domestic and Industrial Wastewater

Alt. No.	Alternative Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Advanced Biological Treatment												
2	Advanced Biological Treatment w/Filtration												
3	Advanced Biological/Chemical Treatment w/Filtration												
4	Conventional Biological Treatment w/ Wetlands												
5	Complete Advanced Treatment Technology												

Legend:

Month when metal concentrations (particularly copper) are estimated to exceed predicted effluent metals criteria as calculated by the EPA spreadsheet.

Months when metal concentrations are marginally close to predicted effluent metals criteria as calculated by the EPA spreadsheet.

Notes:

1) Based on 7Q10 stream flows.

2) Assumes 50% of the 7Q10 and 25% of the 1Q10 stream flow is available for mixing.

3)Assumes background copper concentration of 6 ug/L.

Based on this finding, a second analysis was performed assuming separation of the industrial flow that contributes the high metal influent characteristics. For this analysis the influent characteristics of the remaining wastewater flow (excluding the industrial flow) was used to develop anticipated effluent quality for the treatment alternatives. In addition, this analysis was performed assuming that 100 percent of the 7Q10 and 1Q10 stream flows would be available for mixing. Use of the 100 percent assumption is based on the fact that the stream geometry and hydraulics at the low flow conditions result in the entire stream width being affected by the mixing zone. The results of this second analysis are presented in Figures 4-3 and 4-4.

Figure 4-4 shows the estimated allowable effluent copper concentration as calculated using the EPA spreadsheet compared to the estimated effluent copper concentration from the WWTF, assuming industrial flow is separated and 100 percent of the stream is available for mixing. The months when the copper concentration may exceed the estimated allowable values are shaded. For comparison, the acute copper concentration as defined by OAR 340-41, Table 20 is 18 µg/L. Although the estimated copper values for Alternative 2 appear to exceed the chronic level, they are less than the acute level.

In summary, separation of the industrial metal loads is essential to increasing the potential for meeting the in-stream metal toxicity criteria for discharge to Rickreall Creek. With industrial separation, discharge appears to be feasible during most months, although during low flow periods the in-stream criteria may be exceeded, depending on the treatment system considered. Treatment levels equal to or greater than advanced biological treatment with filtration may be feasible year-round. Because the data set used to perform this analysis was limited and numerous assumptions were made regarding treatment removal efficiencies, subsequent characterization of the waste stream plus actual performance results are needed to ultimately establish whether the metals toxicity criteria can be met with a given treatment system.

Figure 4-3
Estimated Allowable Effluent Copper Concentration vs Stream Flow for Various Plant Flows - Assumes 100% of 7Q10 Stream Flow Available and 6 ug/L Background Copper Concentration

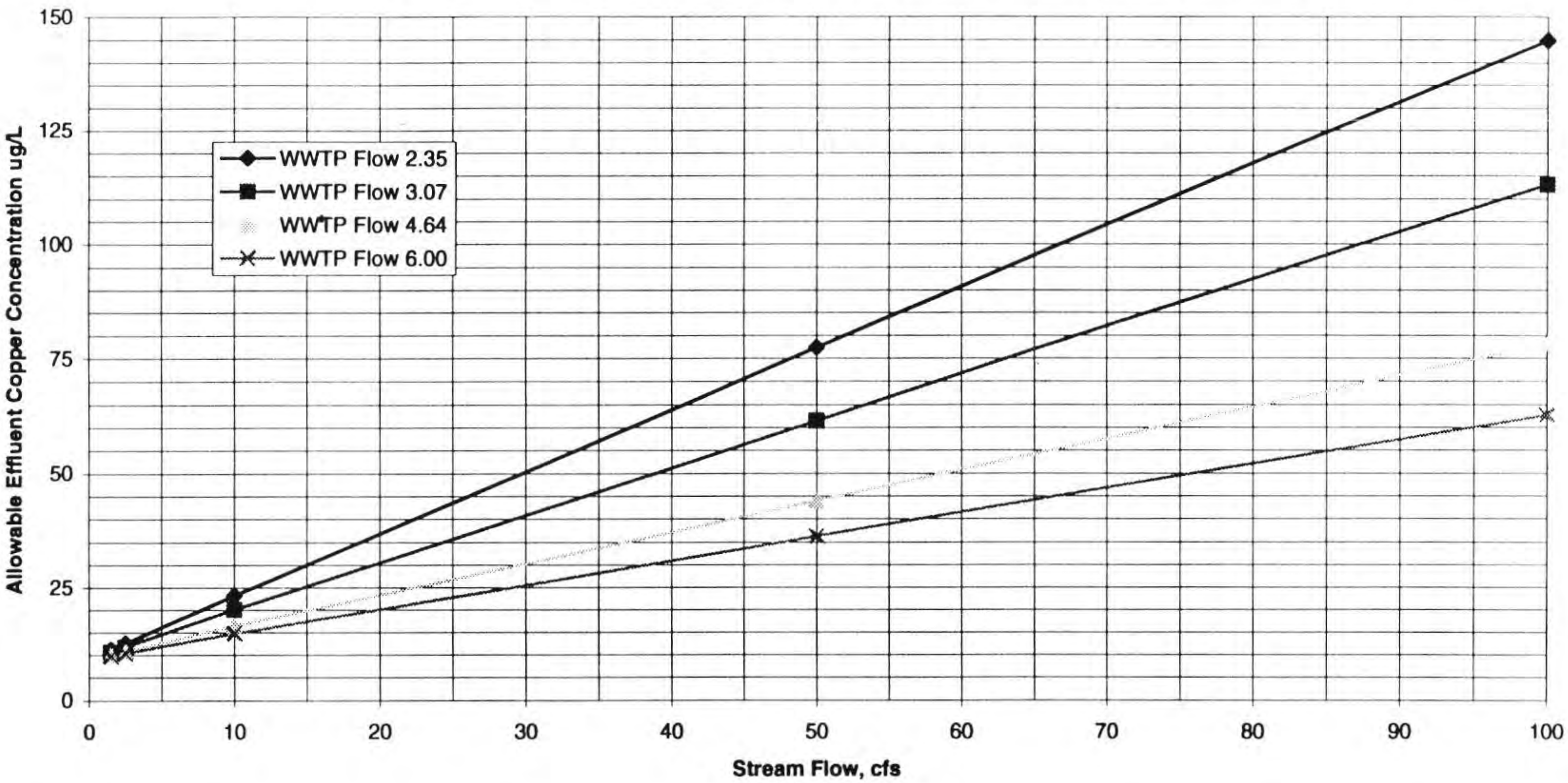


Figure 4-4
Comparison of Estimated Effluent Copper vs Predicted Effluent Copper Criteria for Domestic Wastewater Only

Alt. No.	Alternative Description	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	Advanced Biological Treatment						28	32	32	36	33		
2	Advanced Biological Treatment w/Filtration							16	16	18	16		
3	Advanced Biological/Chemical Treatment w/Filtration												
4	Conventional Biological Treatment w/ Wetlands							19	19	22	20		
5	Complete Advanced Treatment Technology												
Criteria:													
	Predicted WQ criteria for copper (ug/L) based on EPA spreadsheet	43	43	59	44	41	24	14	11	12	14	24	41

Legend:

(shaded) Month when estimated effluent concentration is marginally close or exceeds predicted effluent criteria.

Notes:

1) Based on 7Q10 stream flows.
2) Assumes 100% of 7Q10 amd 1Q10 stream flow available for mixing.
3) Assumes background copper concentration of 6 ug/L.
4) Values in shaded areas represent estimated effluent copper concentration (ug/L) for months when the water quality criteria may be exceeded.

Chapter 5
Infiltration/Inflow Evaluation

CHAPTER 5

INFILTRATION/INFLOW EVALUATION

Introduction

Wastewater collection systems, although constructed to collect and convey wastewater, also inevitably convey a certain quantity of extraneous clear water. This water, commonly referred to as infiltration/inflow (I/I), can originate as groundwater or surface runoff. The entry of groundwater and stormwater runoff into the wastewater collection system increases the cost of operating the wastewater conveyance and treatment facilities.

An I/I evaluation was performed on the sanitary sewer collection system for the City of Dallas. The objective of this evaluation was to estimate the amount of I/I in the collection system and to approximate the quantity of I/I that could be cost-effectively removed. The conclusions serve as a guide to plan additional field investigative work to detect and correct pipeline and manhole defects and control the wet weather sewage bypasses. The preliminary cost-effectiveness analysis presented in this chapter is a comparison to determine if reducing I/I requires less capital expenditure than adding treatment and transport facilities to handle wet weather flows.

This chapter describes the existing conveyance and treatment facilities, wastewater flow components and analysis procedures, and cost-effectiveness analysis. Based on the analyses, recommendations are made as to where I/I reduction efforts would be most effective. Flow rates used are expressed in millions of gallons per day (mgd).

Existing Wastewater Facilities

Collection System

Dallas' wastewater collection system consists of approximately 42 miles of sewer line ranging from 6 to 27 inches in diameter. The majority of the originally combined sewers have been separated since the 1960s. In order to isolate areas where I/I could be cost-effectively removed, the collection system was divided into 10 sewer drainage basins. The basins are schematically illustrated in Figure 5-1 and the basin boundaries are shown in Figure 5-2. Collection system flows were monitored from January 13, 1993, until March 4, 1993. There are two known wastewater bypasses in the collection system: near the intersection of Miller Avenue and Fenton Street, and in the WWTF influent pump station.

There are four lift stations in the collection system to convey wastewater from sewered areas that cannot drain by gravity. The four lift stations are described in Table 5-1 and shown in Figure 5-2. As development continues, new interceptors may be built, which may eliminate the need for some of the lift stations.

The City does not currently report significant hydrogen sulfide corrosion in the lift station pump or discharge manholes above what is seen in the gravity sewer manholes. The pumps seem to operate frequently enough to prevent accumulation of hydrogen sulfide. It is

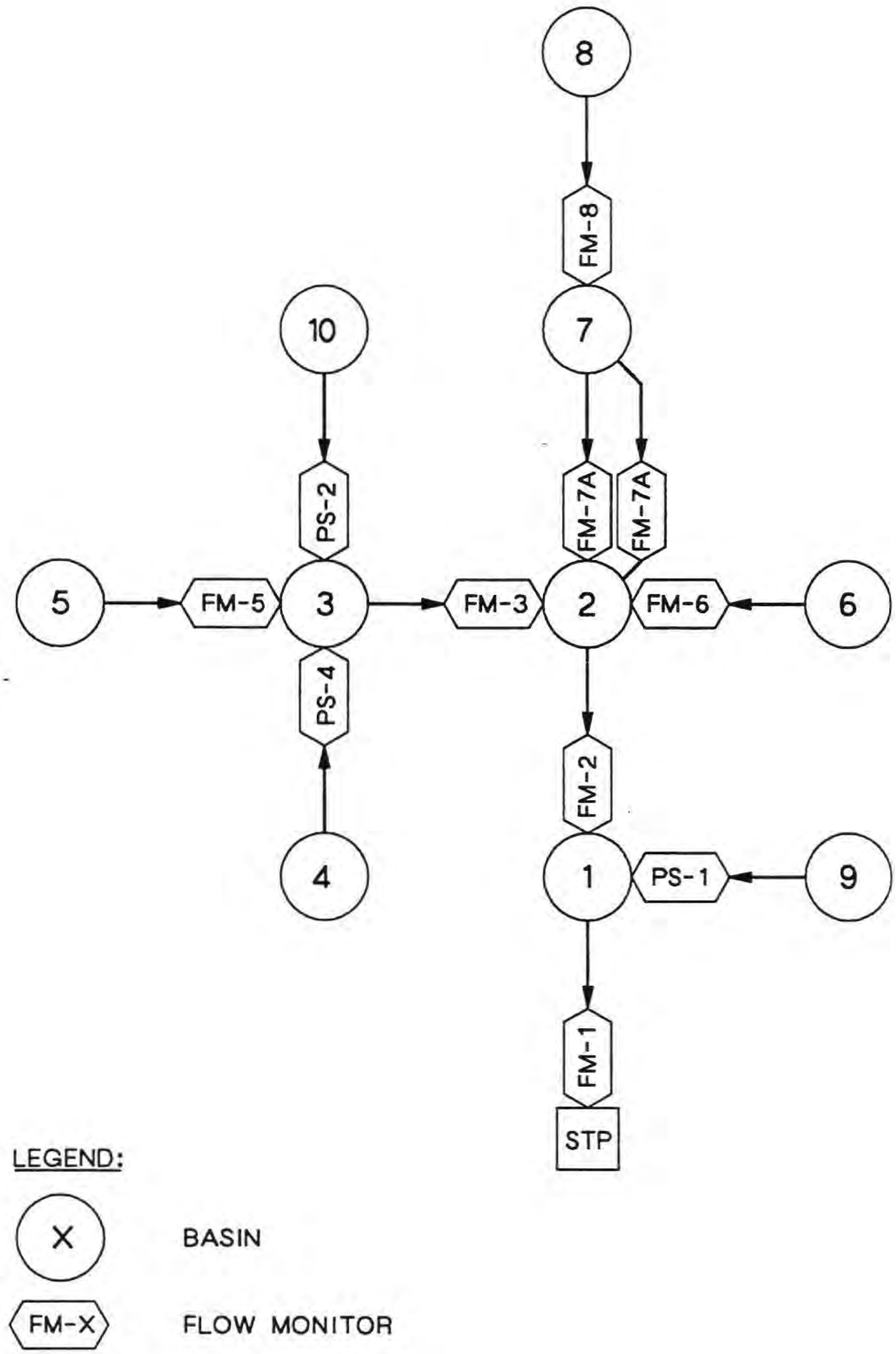


FIGURE 5-1
FLOW MONITORING SCHEMATIC

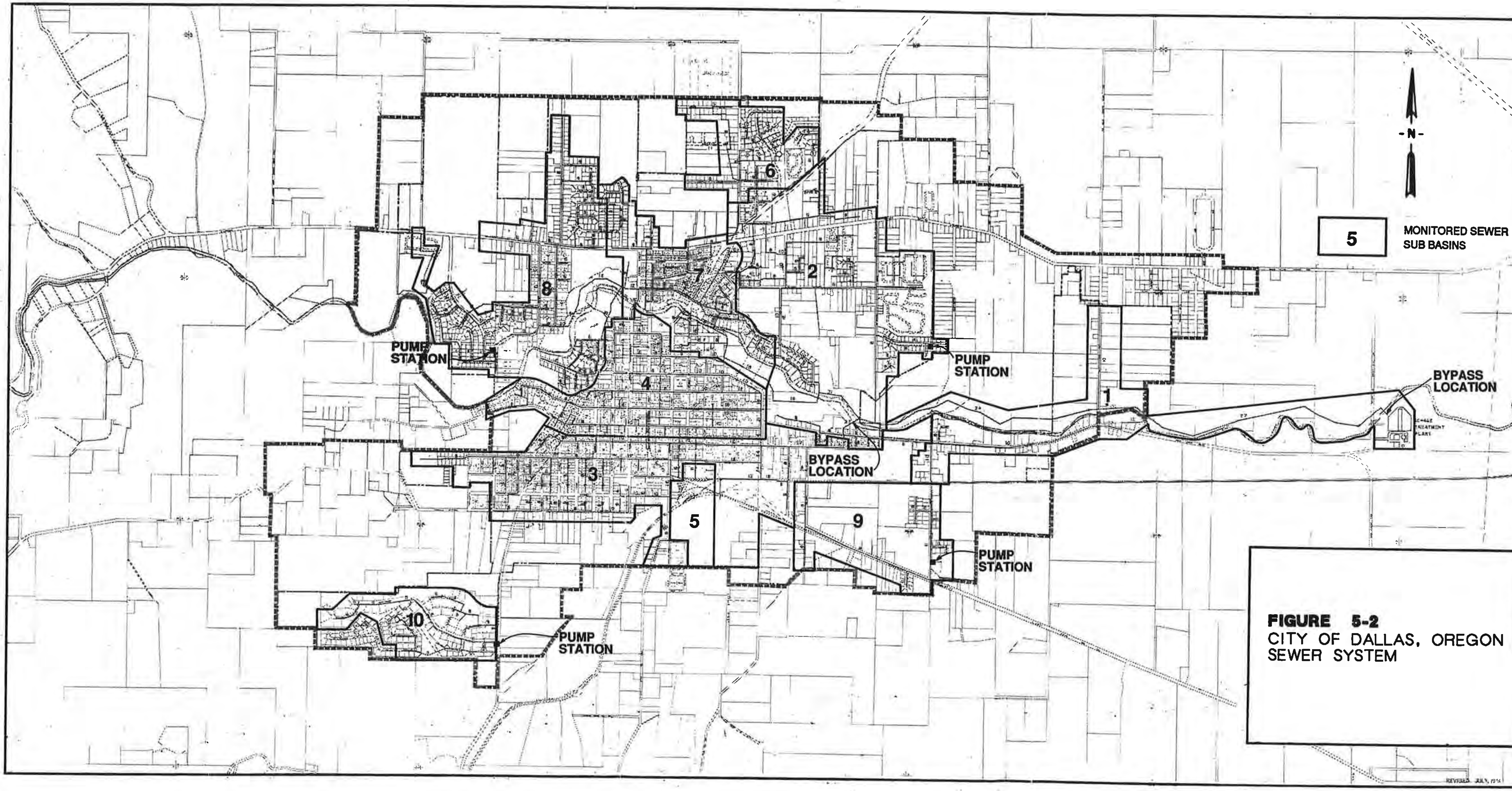


FIGURE 5-2
CITY OF DALLAS, OREGON
SEWER SYSTEM

TABLE 5-1

City of Dallas Wastewater Collection System Lift Stations

Bridlewood Lift Station	
Lift Station	
Type	Wet well mounted, vacuum-primed
Pump Type	Constant-speed, non-clog centrifugal
Capacity (each)	225 gpm @ 90 feet total dynamic head
Number of Pumps	2
Pump hp (each)	15
Level Control Type	Float switches
Overflow Point	Manhole lid
Auxiliary Power Source	none
Alarm Telemetry Type	local alarm light
EPA Reliability Class	II
Force Main	
Length, Pipe Material	3100 feet, 6" PVC
Profile	high point at air release valve
Discharge Manhole	Fairview and Oakdale
Air Release Valves	1200' north of lift station on highway
Vacuum Release Valves	none
Average Detention Time	117 minutes (from flow monitoring)
Sulfide Control System	frequent pumping
Academy Street Lift Station	
Lift Station	
Type	Dry pit
Pump Type	Constant-speed, non-clog centrifugal
Capacity (each)	approx. 125 gpm @ 30 feet total dynamic head
Number of Pumps	2
Pump hp (each)	3
Level Control Type	Float switches
Overflow Point	Manhole lid
Auxiliary Power Source	none
Alarm Telemetry Type	local alarm light and horn
EPA Reliability Class	II
Force Main	
Length, Pipe Material	1200 feet, 4" asbestos concrete
Profile	rise of 15 feet over 1200-foot length
Discharge Manhole	LaCreole and Academy
Air Release Valves	none
Vacuum Release Valves	none
Average Detention Time	unknown (not flow monitored)
Sulfide Control System	frequent pumping
River Drive Lift Station	
Lift Station	
Type	Submersible
Pump Type	Constant-speed, non-clog centrifugal
Capacity (each)	150 gpm @ 29 feet total dynamic head
Number of Pumps	2
Pump hp (each)	4
Level Control Type	Float switches
Overflow Point	Manhole lid
Auxiliary Power Source	none
Alarm Telemetry Type	local alarm light
EPA Reliability Class	II

TABLE 5-1 City of Dallas Wastewater Collection System Lift Stations	
Force Main	
Length, Pipe Material	550 feet, 4" cast iron
Profile	rise of 20' over 550-foot length
Discharge Manhole	River Drive, 550 feet NE of lift station
Air Release Valves	none
Vacuum Release Valves	none
Average Detention Time	unknown (not flow monitored)
Sulfide Control System	frequent pumping
Godsey Road Lift Station	
Lift Station	
Type	Submersible
Pump Type	Constant-speed, non-clog centrifugal
Capacity (each)	500 gpm @ 45 feet total dynamic head
Number of Pumps	2
Pump hp (each)	10
Level Control Type	Float switches
Overflow Point	Manhole lid
Auxiliary Power Source	none
Alarm Telemetry Type	local alarm light
EPA Reliability Class	II
Force Main	
Length, Pipe Material	1500 feet, 6" asbestos concrete
Profile	rise of 11' over 1500-foot length
Discharge Manhole	70 ft north of railroad tracks on Godsey Road
Air Release Valves	none
Vacuum Release Valves	none
Average Detention Time	12 minutes (from flow monitoring)
Sulfide Control System	frequent pumping

recommended that the City develop a hydrogen sulfide monitoring program to confirm the visual observations.

Wastewater Treatment Facility

The City operates a wastewater treatment facility near the intersection of Orrs Corner Road and County Road 7519. Plant bypasses occur when flow exceeds 6.0 mgd because the hydraulic capacity of the existing facility is limited to 6.0 mgd. WWTF flow data, including total daily bypasses, from 1990 through 1992 were provided by the City. The average daily flow for the period of January 1, 1990, through March 4, 1993, was 2.6 mgd including bypasses. Hourly bypass data were provided for the period of January 1, 1992, through March 4, 1993. The estimated peak instantaneous flow (including bypasses) during the period of January 1, 1992, through March 4, 1993, was 13.7 mgd.

Wastewater Flow Analysis

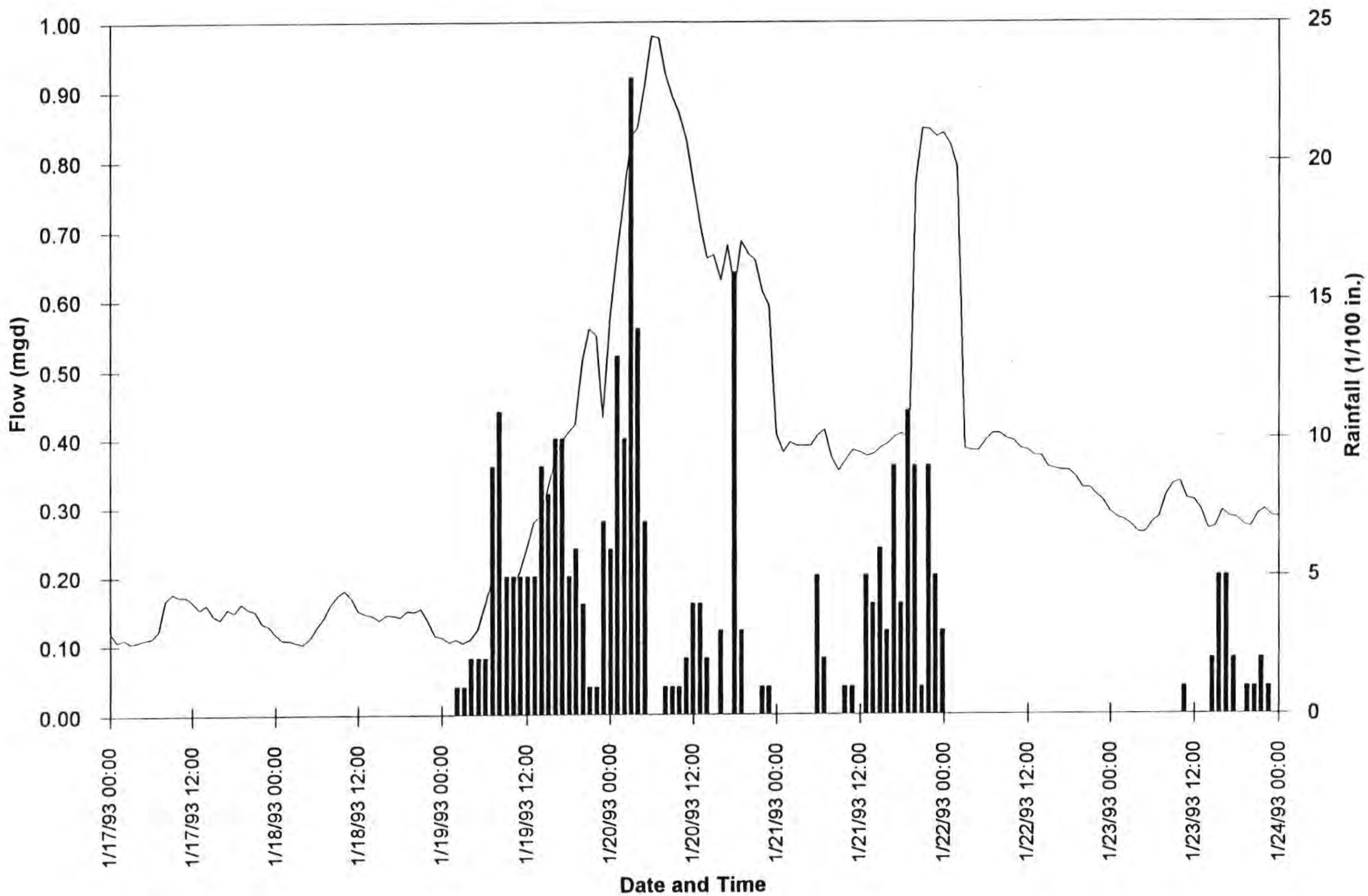
Wastewater flow normally follows a diurnal pattern with peaks occurring in the morning around 8:00 a.m. and in the early evening around 6:00 p.m. with a low trough in the early morning around 4:00 a.m. This base flow pattern is often dramatically altered during rainfall events when the peak can be several times the average base flow. If the conveyance system is unable to transport wastewater to the treatment plant, or if the plant is unable to pass the peak flow, wastewater may back up in the pipe, rise in manholes, or be bypassed into streams. The Oregon Department of Environmental Quality (DEQ) has issued draft guidelines to be used for designing wastewater collection systems and treatment systems. The purpose of the wastewater flow analysis is to determine the base flow, the additional flow that results from rainfall, and the maximum flow the WWTF must be able to hydraulically accommodate.

Flow Monitoring

Continuously recording flow monitoring equipment manufactured by Marsh-McBirney was deployed on January 13. The equipment was installed at two pump stations and eight manholes. Flow monitors were located to divide the collection system into major blocks representing sewer drainage basins.

Originally scheduled to run 4 weeks, the monitoring was extended another 3 weeks because of low rainfall. Flow monitoring ended on March 5, 1993. Figure 5-3 illustrates a typical wastewater hydrograph for Dallas Flow Monitor 6, which measured flows from basin 6. A summary of flow monitoring data is shown in Table 5-2.

The bypass location at the WWTF influent pump station was monitored during the flow monitoring period. The bypass location near the intersection of Miller Avenue and Fenton Street was not monitored. Bypasses were extremely difficult to accurately monitor due to the geometry of bypass piping. City staff have visually observed bypasses at Miller/Fenton over the years. The City has determined that bypasses occur at Miller/Fenton only during the largest bypasses at the WWTF influent pump station. During these extreme high flow events, volumes bypassed at the WWTF influent pump station represent the majority of the total volume bypassed at the two locations. Additional collection system modeling will be performed during the WWTF design to assure that the collection system can convey all flows during the 5-year winter storm and the 10-year summer storm.



Bars=Precipitation
Line=WWTF flow

Figure 5-3
Dallas Facilities Plan
Wastewater Hydrograph for Flow Monitor 6

Table 5-2 Dallas Facility Plan Flow Monitoring Data									
FLOW METER	Average of Feb 16th-18th No Precipitation			January 19th, 1993 1.14 inches in 24 Hours			March 1st, 1993 0.52 inches in 24 Hours		
	Flow in Millions of Gallons per Day (mgd)								
	MIN	MAX	AVE	MIN	MAX	AVE	MIN	MAX	AVE
WWTP	1.187	3.033	1.780	(1) 2.100	(1) 11.390	(1) 5.630	(1) 2.400	(1) 5.800	(1) 4.050
FM 2	1.073	1.924	1.525	N/A	N/A	(2) 4.760	1.475	4.799	3.000
FM 3	0.669	1.037	0.883	0.769	3.240	1.997	0.831	2.138	1.401
FM 4	0.250	0.477	0.375	0.262	0.754	0.515	0.270	0.588	0.388
FM 5	0.148	0.257	0.209	0.120	0.329	0.193	0.130	0.297	0.234
FM 6	0.099	0.214	0.146	0.102	0.559	0.272	0.141	0.283	0.224
FM 7A	0.074	0.155	0.118	0.070	0.271	0.170	0.092	0.213	0.157
FM 7B	0.559	0.810	0.691	0.625	2.085	1.278	N/A	N/A	(3) 0.959
FM 8	0.306	0.482	0.391	0.370	0.946	0.618	0.384	0.712	0.581
PS 1	0.168	0.345	0.275	0.151	0.621	0.433	0.176	0.417	0.320
PS 2	0.028	0.099	0.056	0.024	0.190	0.094	0.045	0.154	0.105

NOTES:

(1) Figures are based on circle chart data from midnight to midnight

(2) Estimate based on flow data from 2/16-2/18 and 3/1

(3) Estimate based on flow data from 1/19 and 2/16-2/18

Rainfall Monitoring

To determine how rainfall related to measured increase in flow, a continuously recording rainfall gage was installed during the sewer monitoring period on the roof of the Les Schwab Tire Building at the intersection of Court and Jefferson Streets. Figure 5-4 plots the 24-hour rainfall during the monitoring period. Total daily rainfall records were provided by the City for calendar years 1990 through 1992.

Design Storm and Peak Flows

The DEQ has issued draft guidelines to be used for designing wastewater collection systems and treatment systems. According to DEQ, a design must hydraulically accommodate the peak instantaneous flow resulting from the 5-year 24-hour storm. The 5-year storm is defined as the storm intensity that will be met or exceeded, on average, only once every 5 years. DEQ suggests using the National Oceanic and Atmospheric Administration (NOAA) as one possible reference.

The 5-year, 24-hour storm is 4 inches according to NOAA Atlas 2. Because 4 inches seemed high, the Oregon Climate Service was consulted. According to State Climatologist George Taylor, it is much more accurate to determine the probable 5-year storm using actual rainfall data collected at Dallas than to use NOAA Atlas 2. Mr. Taylor provided CH2M HILL with daily rainfall data for Dallas from December 2, 1935, through December 31, 1992. The top 15 storms, sorted in descending order, are shown in Table 5-3.

Table 5-3
Largest 24-Hour Storms for Dallas, Oregon 12/2/35 - 12/31/92

Rank	Date	24-Hour Rainfall (inches)
1	12/22/64	4.32
2	11/15/73	4.00
3	1/15/74	3.91
4	11/27/45	3.63
5	12/27/37	3.50
6	12/25/80	3.40
7	12/29/37	3.37
8	1/4/56	3.33
9	12/13/77	3.26
10	12/27/42	3.06
11	2/10/61	3.05
12	12/4/68	3.05
13	2/1/37	3.03
14	2/17/49	2.93
15	2/12/54	2.90

The rank of a storm for a given return period can be estimated by the following formula:

$$m = \frac{n + 1 - 2a}{T} + a$$

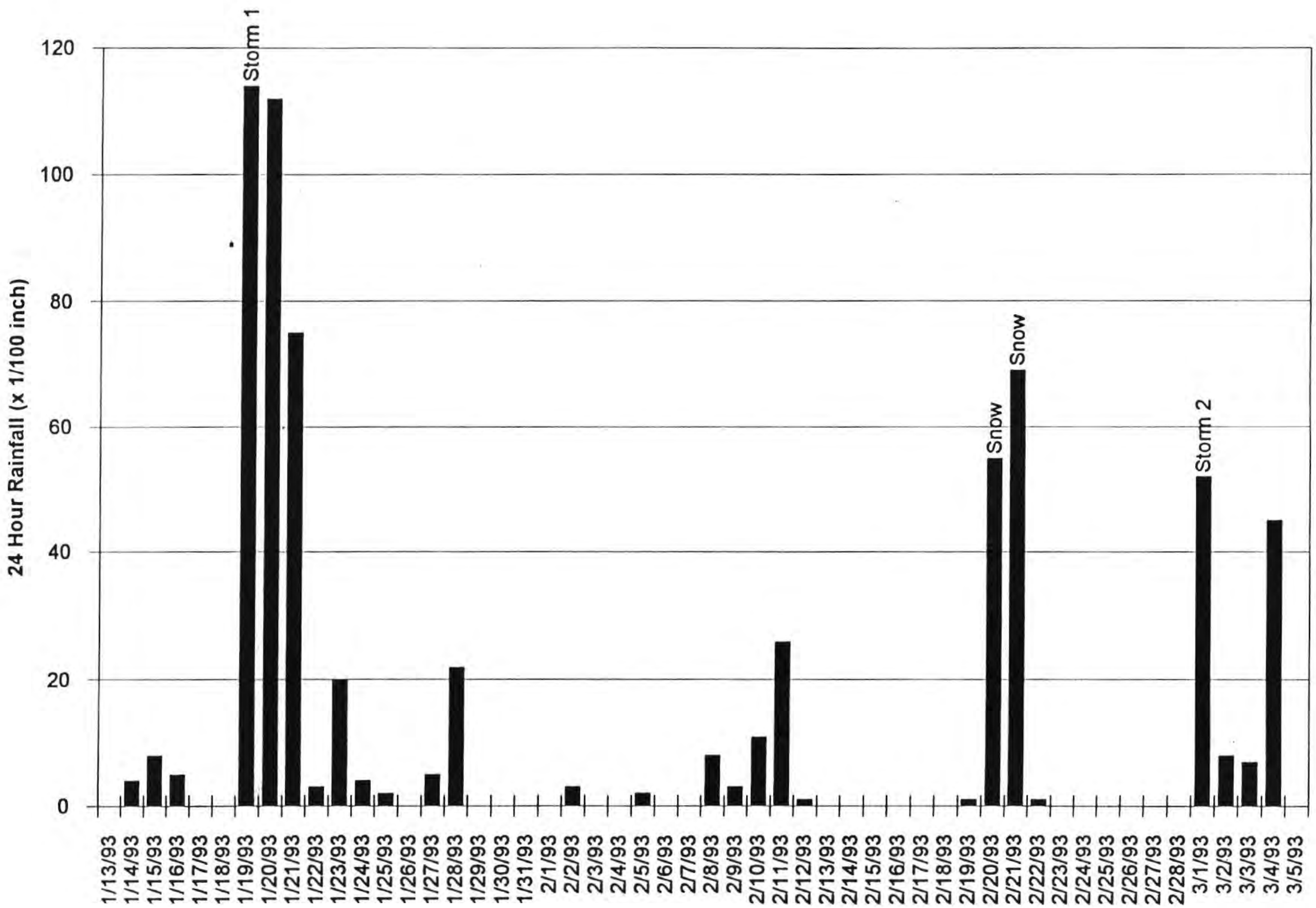


Figure 5-4
Dallas Facilities Plan
24-Hour Rainfall During Flow Monitoring Period

where:

m =	rank of storm
n =	number of storms
a =	parameter based on distribution, ranging from 0.375 for the normal to 0.44 for Gumbel
T =	return period

For this analysis the following values were used:

n =	20849 days from 12/2/35 - 12/31/92
a =	0.40 exact distribution is unknown
T =	1826.25 days (5 years at 365.25 days per year)

The rank of the 5-year storm resulting from these values is 11.81. From Table 5-3, the 11th ranked storm is 3.05 inches. The 5-year 24-hour storm was rounded up to 3.1 inches.

Peak Day Average Daily Flow

The average flow over 24 hours that corresponds to the 5-year 24-hour storm is the peak day average daily flow (PDADF). Average daily flows were plotted against rainfall for the period of January 1, 1990, to March 4, 1993 (Figure 5-5). Because a 5-year storm was not recorded, it was necessary to estimate the PDADF. A linear regression analysis was performed on the data to establish a relationship between average daily flow (ADF) and 24-hour rainfall. The analysis resulted in an estimated ADF of 11.4 mgd, corresponding to a 5-year, 24-hour rainfall of 3.1 inches.

Peak Instantaneous Flow

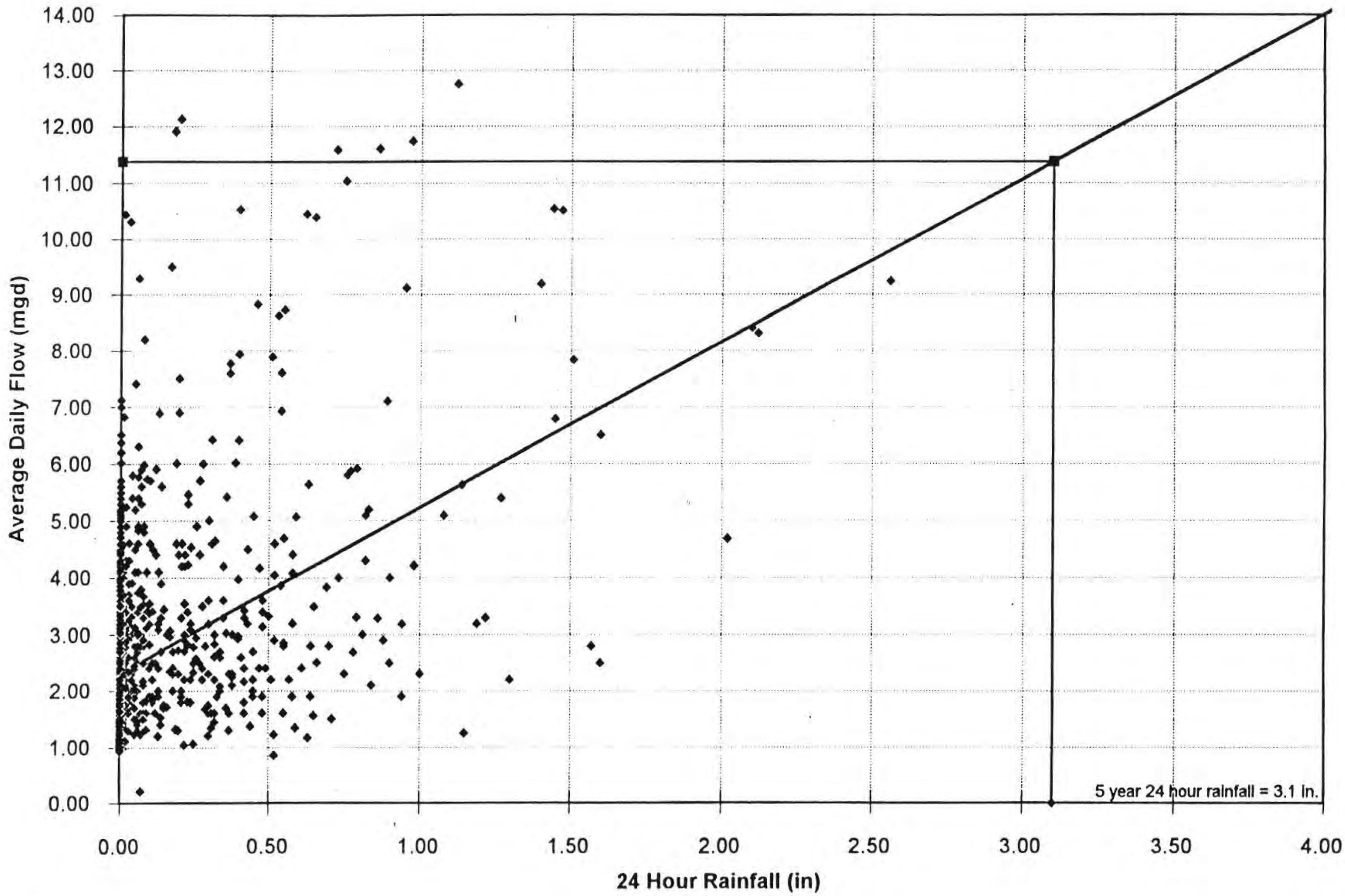
The peak instantaneous flow (PIF) is the instantaneous hydraulic peak. The PIF is used to size pumping facilities, pipelines, and other hydraulic facilities associated with the wastewater treatment operations. The PIF is calculated by multiplying the PDADF by a peaking factor. This may be expressed as:

PIF = PDADF x Peaking Factor

The peaking factor is the ratio of peak flow to average daily flow. The flows include all flow components. Figure 5-6 shows the peaking factor plotted with average daily flow for the period of January 1, 1992, through March 4, 1993. The graph includes only those days with precipitation greater than 0.1 inch. A line fit to the data shows that the peaking factor tends to decrease as average daily flow increases. Because the peaking factor will be influenced by the intensity of the storm, a range of peaking factors is expected for a given flow. The upper limit of the envelope of peaking factors (with one exception) is shown as a broken line on Figure 5-6. The upper limit of the peaking factor for the PDADF of 11.4 mgd is about 1.45. A peaking factor of 1.5 to the PDADF was used in order to ensure the plant design will be able to accommodate the hydraulic peak. Given a PDADF of 11.4 mgd and a peaking factor of 1.5, the current PIF is estimated as 17.1 mgd.

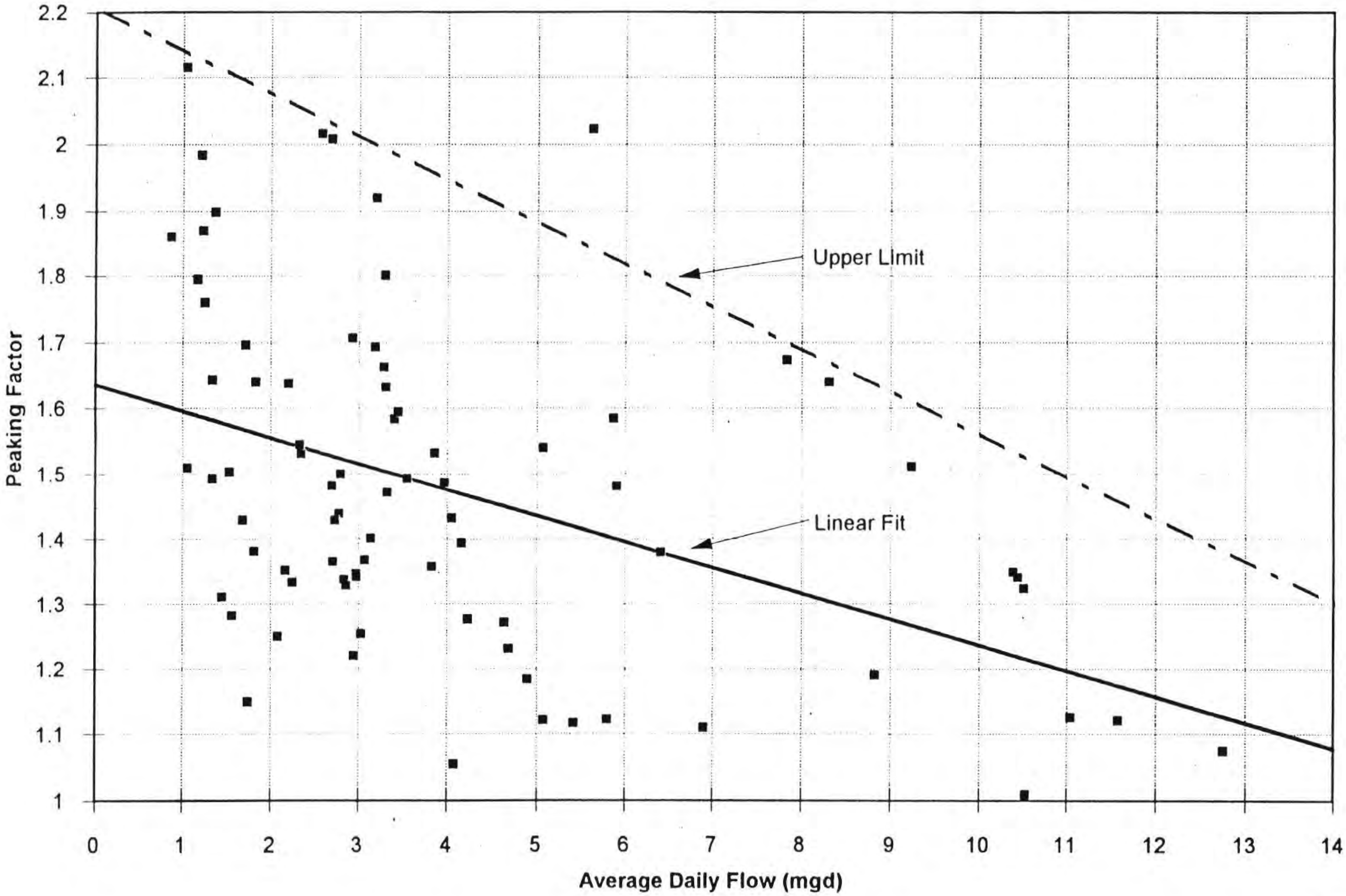
Reliability of Estimates

In order to measure the reliability of the estimated PDADF, the correlation coefficient of ADF and 24-hour rainfall was calculated. The correlation coefficient is a measure of how well a line describes the relationship between two sets of data. As a general rule, a



NOTES:
Flow data from 1/1/90 - 3/4/93 period.
Average daily flow = WWTP recorded daily average + recorded total daily bypasses.
The 5-year 24-hour storm was determined using Dallas precipitation data.

Figure 5-5
Dallas Facilities Plan
Wastewater Treatment Plant Flow vs. Precipitation



Peaking Factor = (Peak Instantaneous Flow)/(Average Daily Flow)
Ave Daily Flow = WWTP recorded daily averages + recorded total daily bypasses.
Peak Instantaneous flow = WWTP recorded peaks + recorded peak hourly bypasses.

Figure 5-6
Dallas Facilities Plan
Peaking Factor vs. 24-Hour Rainfall > 1/10 in
1/1/92 - 3/4/93

correlation coefficient greater than 0.85 is a good fit. The correlation coefficient of the linear fit was 0.46, indicating that factors other than 24-hour rainfall influence ADF. One such factor is precipitation preceding the 24-hour event.

Precedent precipitation may influence the rate and amount of I/I that gets into the collection system. For example, the highest ADF for the January 1, 1990, to March 4, 1993, period occurred on a day that had only 1.12 inches of rainfall. This 12.75-mgd flow occurred on January 20, 1993. On January 19 it rained 1.14 inches, yet the ADF was only 5.63 mgd. It appears that rainfall on the 19th affected wastewater flow on the 20th.

Another source of error was introduced in the PDADF estimate because rainfall data and WWTF flow data covered different time intervals. Total rainfall data were recorded at 5:00 p.m. while total WWTF flow data were recorded at 9:00 a.m. The City should consider installing a raingage at the WWTF so that the rainfall data and flow data will represent the same time period.

Wastewater Flow Components

Collection system wastewater flow components include sanitary flow and extraneous infiltration and inflow. Sources that allow direct entry of stormwater (inflow) include connected downspouts, manhole covers, area or yard drains, and catch basins. Indirect sources (infiltration) include defective pipe, open or cracked joints, and deteriorated manhole walls. Infiltration may be a result of the sewer line being below the water table, or it may be a result of stormwater passing through the soil and entering the sewer line. This type of extra flow occupies pipeline capacity that is normally available for sanitary flow and increases the volume of water that must be treated at the wastewater treatment plant.

Sanitary Flow

Sanitary flow is composed of all residential, commercial, and industrial wastewater discharge. The sanitary flow was estimated based on summer flow measurements.

Infiltration/Inflow

I/I consists of groundwater infiltration and rainfall dependent I/I.

Groundwater Infiltration. Groundwater infiltration (GWI) enters the system through deeper pipeline defects located below the groundwater table. GWI tends to contribute to a long-term volumetric problem; however, since the costs associated with its removal tend to be high compared to the benefits achieved, it was assumed that GWI would remain in the sewer system.

Rainfall Dependent Infiltration/Inflow. Rainfall dependent infiltration/inflow (RDI/I) is the total flow entering the sewer system as a direct result of a rain event. Rainfall dependent infiltration enters the system through pipe defects as does GWI, but because of its rain-dependent response, it contributes to peak flows. Rainfall dependent inflow enters the collection system through direct connections.

Flow Analysis Procedure

The analyses conducted during this study are based on the 5-year design storm. The procedure for analyzing monitoring data to separate wastewater into its components is described in this section.

Storm Selection

Two significant storms occurred during the monitoring period that were not affected by snow melt. January 19th had a 24-hour rainfall of 1.14 inches and March 1 had a 24-hour rainfall of 0.52 inches.

Average Baseflow

The average baseflow (ABF) at a flow monitoring site is developed by selecting several days of flow data from a dry period during the monitoring period. An ABF hydrograph, composed of sanitary flow and GWI, is developed for each site. A composite 1-day hydrograph was created for Dallas by averaging the hourly flows for 3 days during the dry period of February 16 through 18. ABF can be defined as:

ABF = SF + GWI

where:

ABF = average baseflow
SF = sanitary flow
GWI = groundwater infiltration

GWI was assumed to be negligible during the driest month of 1992, August. The sanitary flow for the monitoring period was assumed to be equal to the average baseflow during August 1992. During the wet season, ABF on a day with no precipitation is higher than ABF during the driest month of the dry season. This difference is assumed to be GWI. Based on these assumptions, for each basin, GWI during the monitoring period was estimated to be 64 percent of the minimum ABF in that basin. With the ABF known for the basin and GWI estimated, sanitary flow for the basin may then be calculated.

Average Daily Flow

The average daily flow (ADF) is the average flow from all sources in the basin over a 24-hour period. The average daily flow can be defined as:

ADF = RDI/I + ABF

where:

ADF = average daily flow
RDI/I = rainfall-dependent infiltration/inflow
ABF = average baseflow

During dry periods when RDI/I is zero, the ADF is equal to the ABF.

Basin Peak Flows

The PDADF for each basin was estimated by assuming a linear relationship between rainfall and wastewater flow. Flow monitoring data from the two selected storms and the ABF for each basin was extrapolated to estimate the PDADF resulting from the 5-year storm. The sum of the basin peak day average daily flows was 11.35 mgd. This is very close to the 11.4 mgd peak day average daily flow predicted based on WWTF data. A peaking factor was calculated for each basin based on the two storms. Using the basin peaking factor and basin ADF, a peak flow for each basin was calculated. Table 5-4 shows the estimates of all flow components. Table 5-5 shows the development of the projected average daily flows for each basin.

Cost-effectiveness Analysis

A cost-effectiveness analysis was conducted for each basin to determine whether I/I could be economically eliminated from any part of the Dallas collection system. The cost-effectiveness analysis compares the present value of estimated I/I reduction costs to the present value of estimated costs of continued conveyance and treatment of I/I. The least expensive combination of rehabilitation, conveyance, and treatment costs represents the cost-effective solution to I/I reduction.

This section presents the estimated costs of I/I reduction and the estimated costs of conveyance and treatment of I/I. The approximate amount of I/I that can be cost-effectively eliminated is also presented in this section.

Methodology Review

All analyses assume the collection and treatment system will be able to convey and treat the design storm in accordance with DEQ guidelines. This may be accomplished through any combination of increases in capacity and reduction of I/I. The total marginal cost is the additional conveyance, treatment, O&M, and I/I reduction costs required to meet DEQ guidelines.

Because groundwater infiltration is typically the most difficult component of I/I to remove, it was assumed that I/I reduction efforts would only be directed towards RDI/I. The flows associated with four levels (0, 25 percent, 50 percent, 75 percent) of RDI/I removal were calculated for each basin. The level of I/I reduction that resulted in the lowest total marginal cost was the cost-effective option. In cases where the marginal cost between two levels of I/I reduction were very close, the lower level of reduction was used. Figure 5-7 illustrates a typical cost-effective analysis curve for basin 2.

I/I Reduction Cost

Table 5-6 shows the estimated extent of system evaluation, source removal, service lateral replacement, roof drain removal, system replacement, and pipeline grouting and sealing required to achieve each of four levels of I/I reduction. For each level of reduction, the costs associated with the percentages of rehabilitation were calculated.

Table 5-4
Dallas Facility Plan
Estimated Flow Components for Five-year, 24-hour Storm

	Basin 1	Basin 2	Basin 3	Basin 4	Basin 5	Basin 6	Basin 7	Basin 8	Basin 9	Basin 10	TOTAL
	Flow in Million Gallons per Day (mgd)										
Sanitary Flow											
Average	0.02	0.13	0.12	0.22	0.11	0.08	0.21	0.20	0.17	0.04	1.30
Peak	0.04	0.22	0.19	0.32	0.16	0.15	0.30	0.29	0.24	0.08	1.99
GWI (1)	0.02	0.14	0.12	0.16	0.09	0.06	0.21	0.20	0.11	0.02	1.13
RDI/I											
Average	1.16	2.02	2.59	0.37	0.15	0.35	1.11	0.63	0.42	0.11	8.92
Peak	1.75	3.75	4.67	0.63	0.20	0.60	1.93	0.93	0.61	0.19	15.27
Total Flow											
Average	1.21	2.29	2.83	0.75	0.36	0.49	1.52	1.03	0.70	0.17	11.35
Peak	1.82	4.11	4.98	1.11	0.45	0.82	2.44	1.42	0.96	0.29	(2) 18.39

NOTES:
(1) Groundwater infiltration is estimated as 64% of minimum ABF.
(2) Peak flow at the WWTF is estimated to be 17.1 mgd. This figure was obtained by applying a peaking factor of 1.5 to a projected peak daily average flow of 11.4 mgd. Peak flows by basin add up to 18.4 mgd. This difference can be explained by flow attenuation as a result of routing effects.

Table 5-5
Dallas Facility Plan
Projected Flows Resulting From the 5-year, 24-hour Storm Assuming a Linear Response of Flow to Rainfall

DESIGN ASSUMPTIONS	
5-Year 24-Hour Storm	3.1 in
WWTF Peak Day Average Daily Flow	11.4 mgd
WWTF Peaking Factor	1.5
WWTF Peak Instantaneous Flow	17.1 mgd

	ADF 2/16-2/18 (mgd)	ADF 1/19 (mgd)	ADF 3/1 (mgd)	Slope	Y-Intercept	Design Storm Average Flow (mgd)	Design Storm Average RDI/I (mgd)	Basin Area (acres)	Average RDI/I per Acre (gpad)	Total Length (in-miles)	Average RDI/I per length (gpd/in-mile)	Basin Peaking Factor	5-Year Storm PIF (mgd)
24 hr. Rainfall --->	0.00 in.	1.14 in.	0.52 in.										
1	(1) 0.047	0.437	0.730	0.317	0.229	1.211	1.164	264	4,409	77.7	14980	1.50	1.816
2	(1) 0.272	1.043	0.259	0.695	0.140	2.295	2.023	402	5,031	59.2	34164	1.79	4.107
3	0.243	1.195	0.674	0.835	0.242	2.831	2.588	362	7,149	74.9	34554	1.76	4.983
4	0.375	0.515	0.388	0.125	0.357	0.745	0.370	203	1,825	62.6	5917	1.49	1.111
5	0.209	0.193	0.234	(2) 0.048	(2) 0.209	0.358	0.149	40	3,726	2.7	55199	1.27	0.455
6	0.146	0.272	0.224	0.109	0.153	0.493	0.347	103	3,367	20.4	17000	1.66	0.818
7	0.418	0.830	0.535	0.365	0.392	1.524	1.106	170	6,506	44.1	25078	1.60	2.438
8	0.391	0.618	0.581	0.195	0.422	1.026	0.635	291	2,182	39.2	16195	1.38	1.416
9	0.275	0.433	0.320	0.140	0.265	0.699	0.424	150	2,828	13.3	31891	1.37	0.958
10	0.056	0.094	0.105	0.032	0.067	0.166	0.110	118	930	12.7	8643	1.73	0.287
	Total	Total	Total			Total	Total	Total	(3) Ave	Total	(4) Ave	(5) Ave	(6) Total
	2.432	5.630	4.050			11.3	8.9	2103	4,239	406.8	21916	1.62	18.4

NOTES:
(1) Estimated based on winter water use records.
(2) Linear fit does not use 1/19 data for Basin 5.
(3) Average weighted by basin area.
(4) Average weighted by total inch miles of pipe in each basin.
(5) Average weighted by 5-year, 24-hour average flow.
(6) Peak flow at the WWTF is calculated as 17.1 mgd. This figure was obtained by applying a peaking factor of 1.5 to a projected peak daily average flow of 11.4 mgd. Peak flows by basin add up to 18.4 mgd. This difference can be explained by flow attenuation as a result of routing effects.

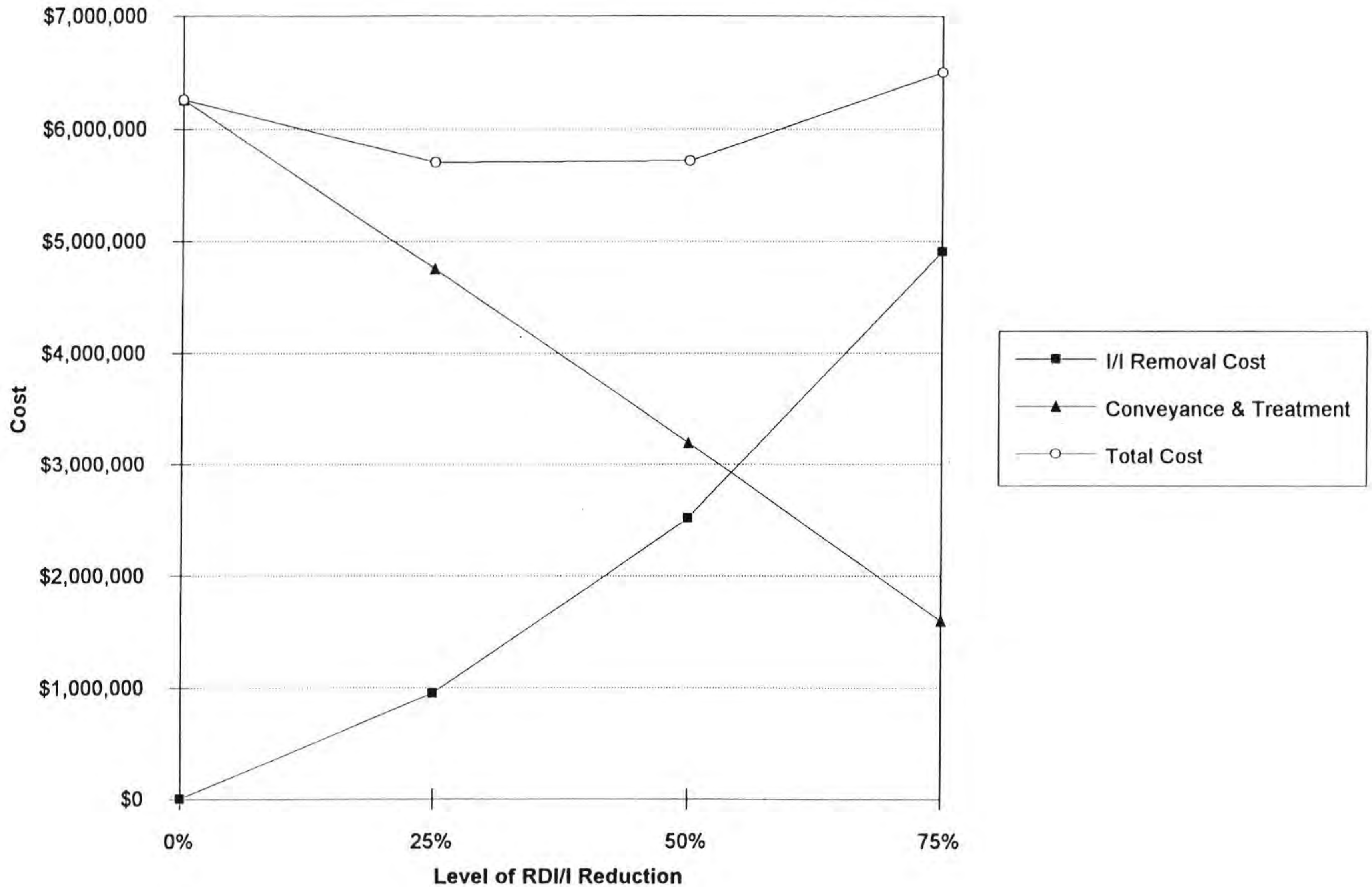


Figure 5-7
Dallas Facilities Plan
Marginal Cost vs. Level of RDI/I Reduction for Basin 2

Table 5-6 System Rehabilitation Required for I/I Reduction						
RDI/I Removal (%)	SSES (%)	Source Removal (%)	Service Replacement (%)	Roof Drain Removal (%)	System Replacement (%)	Grout and Seal (%)
0%	0%	0%	0%	0%	0%	0%
25%	100%	50%	15%	15%	20%	20%
50%	100%	75%	50%	50%	50%	50%
75%	100%	100%	95%	100%	95%	0%

Reduction of I/I involves identification of actual I/I sources and subsequent sewer system rehabilitation. The following paragraphs describe the sewer system evaluation survey (SSES), system rehabilitation techniques, and cost estimates.

Sewer System Evaluation Survey

An SSES is usually conducted to identify I/I sources. The SSES is a systematic survey of the collection system undertaken to establish the type, location, and flow rate of specific sources of I/I. The estimated cost and the cost-effectiveness of eliminating or reducing each source of I/I are also determined as part of the SSES. The SSES performed in 1980 should be updated for those basins where rehabilitation efforts will be made. An assumption was made that an SSES for a basin would cost the same for any level of I/I reduction.

Basic costs for an SSES may range from $0.65 to $0.90 per linear foot of pipeline. This includes costs for smoke testing, visual inspections, limited cleaning and television inspections, recommendations for rehabilitation, and a 35 percent contingency.

Collection System Rehabilitation

Sources. Sources of excessive I/I should be removed from the collection system. I/I sources may include catch basin connections, area drains, abandoned service connections, foundation drains, roof drain connections, and submerged manhole covers. I/I source removal is generally very effective for reducing I/I if the sewer line in the area is otherwise in good condition. The estimated number of sources is based on the length of sewer and the I/I rate per acre. The average cost of removing each source is estimated as $2,500 plus a 35 percent contingency.

Service Connections and Roof Drains. Private owners' service laterals are another potential source if I/I. The cost of service lateral replacement was estimated at $1,200 per service plus a 35 percent contingency.

Roof Drains. Dallas has a city ordinance that prohibits the connection of roof drains to the sanitary sewer system. Low interest loans are available to assist homeowners in removing roof drains. The estimated cost of removal was $1,500 per residence plus a 35 percent contingency.

System Replacement. System replacement is defined as the cost of replacing or relining existing deteriorated sewer line for the purpose of eliminating I/I. Costs associated with upgrading sewer line to increase capacity are covered under the Wastewater Conveyance and Treatment Costs section below. The cost of replacing the entire collection system in each basin was estimated from Environmental Protection Agency wastewater conveyance construction cost data. The estimated percentage of the total system that would require replacement for each increment of I/I reduction is shown in Table 5-6.

Grouting and Sealing. The cost of grouting and sealing was estimated from data provided by a private grouting service (Gelco). Grouting and sealing costs assume that one in four joints would require grouting and pressure testing.

Wastewater Conveyance and Treatment Costs

If I/I is not removed from the collection system it must be conveyed to the treatment plant and treated. Conveyance and treatment costs were estimated for the four levels of I/I reduction. Costs were assigned to a given basin based on the basin's contribution to the total I/I treated at the plant. Cost estimates include capital costs for wastewater conveyance and treatment, present worth costs for system operation and maintenance, and a 35 percent contingency. The present value of estimated annual O&M costs was calculated using a 20-year period and an interest rate of 8.875.

Wastewater Treatment Capital Costs

Wastewater treatment costs were estimated using EPA cost curves. It was assumed that the treatment level required would be secondary treatment with filtration. The current design wet weather maximum monthly average daily flow (WWMMADF) (see Table 3-3) was assumed to be 6.76 mgd. The flow components of the WWMMADF were 2.43 mgd from sanitary flow and groundwater infiltration and 4.33 mgd from RDI/I. The maximum wastewater treatment capital cost savings associated with I/I reduction efforts is the cost of expanding a 2.43 mgd plant by 4.33 mgd to 6.76 mgd.

Collection System Capital Costs

Currently, the La Creole interceptor transports all flows from the city to the wastewater treatment plant. Flow monitoring and field observations indicated that wastewater backs up in the La Creole interceptor. The estimated open channel capacity of this interceptor is 8 to 9 mgd. Under surcharged condition, flows as high as 13.7 mgd (including bypasses) were observed during the monitoring period. A sanitary sewer plan performed by CH2M HILL in 1971 suggested that a new Lower Ash Creek interceptor be built to relieve overloading of the La Creole interceptor. The costs provided in the 1971 report were brought forward to a 1993 cost index using *Engineering News-Record* data. Capital costs of the new interceptor were assigned to a given basin on the basis of that basin's contribution to total RDI/I.

Conclusions and Recommendations

Cost-effective I/I Reduction

The factors that most influenced the cost-effectiveness analysis were system replacement costs and costs associated with wastewater treatment. The apparent most cost-effective solution to I/I reduction for each basin is shown in Table 5-7. If RDI/I is reduced by the levels indicated in the table, the estimated current PIF may be lowered from 17.1 mgd to 14.3 mgd.

The recommended levels of I/I reduction should be recognized as estimates and used to guide further investigation and subsequent system repair. In all basins where I/I reduction appears cost-effective, the sewer system evaluation study should be updated. Smoke testing, visual inspections, and television inspections should be performed to identify exact sources of I/I and better estimate the costs of correcting the sources.

I/I reduction appears to have the most likelihood of success in basin 5 and basin 9. Basin 5 is heavily influenced by Willamette Industries' mill operation. The inconsistent nature of Willamette Industries' discharge makes it difficult to establish an average base flow for the basin. This may have created error in the estimates of I/I for basin 5. The City should work closely with Willamette Industries to confirm I/I estimates before reduction efforts begin.

In order to evaluate the effectiveness of I/I reduction efforts, the City should consider implementing a regular flow monitoring program. The monitoring program will help the City determine if I/I reduction goals are being met. If reduction efforts are not proving cost-effective, the program should be reassessed and modified accordingly.

Table 5-7
Cost-Effective Solutions for I/I Reduction

Basin	RDI/I Reduction Level	I/I Reduction (million $)	Conveyance Treatment (million $)	Peak Day ADF (mgd)	Peak Day PIF (mgd)
1	0%	$0.00	$3.35	1.22	1.69
2	25%	$0.95	$4.75	1.80	2.95
3	25%	$1.21	$5.85	2.19	3.55
4	0%	$0.00	$2.28	0.75	1.03
5	75%	$0.19	$0.43	0.25	0.29
6	0%	$0.00	$1.44	0.50	0.76
7	25%	$0.69	$3.24	1.25	1.82
8	0%	$0.00	$2.84	1.03	1.32
9	50%	$0.48	$1.10	0.49	0.61
10	0%	$0.00	$0.49	0.17	0.27
TOTALS		$3.53	$25.75	9.64	14.29

Relief of Overloaded Interceptors

One indication that a sewer may be overloaded is wastewater backing up in the pipe and rising in manholes. In extreme cases, this can result in wastewater overflowing into city streets, residences, and businesses. Backed-up flow was observed or recorded at the following flow monitor sites: FM-2, FM-3, FM-5, FM-6, FM-7B, FM-8.

The La Creole interceptor receives all of the city's sanitary sewage. Preliminary calculations estimate the capacity of the La Creole interceptor as 8 to 9 mgd, although because of surcharging effects, higher flows are possible through this system. Since an estimated 5-year PIF of 14.3 mgd will need to be conveyed to the plant even after I/I reduction efforts, there is a need to have the ability to convey approximately 5.3 mgd of additional flow. Expansion of the wastewater treatment plant should occur in conjunction with relief of the La Creole interceptor.

The 1971 sanitary sewer plan anticipated construction of the Lower Ash Creek interceptor running from the intersection of Ash and Fenton through the undeveloped area southeast of the city. This approach still appears to be sound. The construction of the Lower Ash Creek interceptor will relieve flow through the La Creole interceptor, provide the additional system capacity needed, and will minimize the potential for future bypasses. The overall collection system improvements are summarized in Chapter 9.

If the bypasses at the WWTF influent pump station are eliminated, it is believed that the bypasses at Miller/Fenton (upgradient of the pump station) will also be eliminated. However, without further analysis of the collection system, it is not possible to predict whether further bypasses will occur at Miller/Fenton. Additional analysis of the collection system is anticipated during the initial preliminary design phase.

Collection System Evaluation

The flow estimates presented in this section clearly show that significant improvements are needed to both the collection system and the wastewater treatment plant. In order to ensure that improvements to the collection system will be effective, the City should consider undertaking a sewer system evaluation study (SSES). The collection system evaluation will optimize existing collection system capacity for immediate needs and for future growth.

Chapter 6
Water Quality and Regulatory Standards and Criteria

CHAPTER 6

WATER QUALITY AND REGULATORY STANDARDS AND CRITERIA

Introduction

This chapter summarizes current and proposed regulations, and establishes design criteria to be used in the development of the various treatment and disposal alternatives for the City of Dallas wastewater treatment system. The criteria listed include Willamette Basin standards, Rickreall Creek and Willamette River discharge criteria, reuse criteria for land application of effluent and biosolids, and EPA criteria for reliability and redundancy.

USEPA Secondary Treatment Regulation

The USEPA Secondary Treatment Regulation is defined under 40 CFR, Part 133. Under this regulation, secondary treatment is defined in terms of effluent quality and treatment efficiency. Treatment facilities must achieve effluent concentrations of BOD and TSS of less than 30 mg/L and must have an effluent pH in the range of 6.0 to 9.0. In addition, the removal percentage of BOD and TSS through the treatment facility must be at least 85 percent.

There are special considerations in the Secondary Treatment Regulation for treatment facilities that may not be able to achieve the 85 percent removal requirement of BOD and TSS. One special consideration is for treatment facilities with less concentrated influent wastewater for a collection system with separated sewers. A lower percent removal requirement may be granted if the following is demonstrated:

1. The treatment facility is consistently meeting, or will consistently meet, its permit effluent concentration limits but its percent removal requirements cannot be met because of less concentrated influent wastewater.

2. To meet the percent removal requirements, the treatment facility would have to achieve significantly more stringent limitations than would otherwise be required by the concentration-based standards.

3. The less concentrated influent wastewater is not the result of excessive I/I. Excessive I/I is defined as the quantities of infiltration/inflow that can be economically eliminated from a sewer system as determined in a cost-effectiveness analysis that compares the costs for correcting the infiltration/inflow conditions to the total costs for transportation and treatment of the infiltration/inflow. Also, to further demonstrate that inflow is nonexcessive, total average flow to the plant must be less than 275 gallons per capita per day.

As shown in Chapter 2, the Dallas WWTF currently has a less concentrated influent wastewater, especially during the winter. Future projected influent wastewater quality is also expected to be less concentrated, as shown in Chapter 3, even after the sewer rehabilitation work recommended by the cost-effectiveness analysis discussed in Chapter 5. Therefore, meeting the 85 percent removal requirement may require significantly more stringent effluent limitations than would be required by the concentration-based limits.

Willamette Basin Water Quality Standards

The standards for river basins in the State of Oregon are established by the Department of Environmental Quality (DEQ) through the Oregon Administrative Rules (OAR) 340-41-445. These rules are reviewed every 3 years for setting new or modifying existing standards. The following presents a discussion of state water quality standards for specific reaches of the Willamette River and its tributaries. Proposed amendments to OAR 340-41-445 resulting from the most recent triennial review were adopted in January 1996, although implementation will not occur until July 1, 1996, to allow time for development of implementation guidance. The criteria, including the amendments, are discussed in more detail as follows.

Water Quality Parameters/Standards

Dissolved Oxygen (DO). Table 6-1 presents the existing DO standards as a function of specific river location and classification:

Table 6-1
Existing Dissolved Oxygen Standards*

Location of Outfall	Standard
Main stem Willamette River from Salem to confluence of Coast and Middle Forks, river mile 187:	The DO concentrations shall not be less than 90 percent of saturation.
All tributaries that are salmonid fish producing waters:	The DO concentration shall not be less than 90 percent of saturation at seasonal low or less than 95 percent of saturation in spawning areas during spawning, incubation, hatching, and fry stages of salmonid fishes.
Non-salmonid fish producing waters:	The DO concentration shall not be less than 6 mg/L.

*From Oregon Administrative Rules (OAR) Chapter 340, Division 41.

Table 6-2 presents the revised DO standards as a function of the river classification. DEQ has indicated that Rickreall Creek will be classified as a "Cool Water."

Table 6-2 Revised Dissolved Oxygen Standards				
Classification	Concentration and Period (All in Units of mg/L)[a]			
	30 Day	7 Day	7 Minimum	Minimum
Salmonid Spawning		11.0[b]		9.0
Cold Water	8.0		6.5	6.0
Cool Water	6.5		5.0	4.0
Warm Water	5.5			4.0

[a] 30 Day = Thirty-day mean minimum.
7-Day = Minimum of 7 seven consecutive day floating average of the calculated daily mean.
7 Minimum = Minimum of 7 consecutive day floating average of the daily minimum concentration.
Minimum = The minimum record concentration including seasonal and diurnal minimums.
[b] Shaded values indicate absolute minimum criteria.

Temperature. Table 6-3 presents the existing temperature standards as a function of specific river location and classification: Table 6-4 presents the revised temperature standards as a function of specific location or beneficial use. As indicated in Item B of the revised standard, exceptions may be granted if 1) it can be shown that the beneficial uses are not impaired, or 2) a source is implementing all reasonable management practices or measures, the source's activity will not significantly affect the beneficial use of the water body, and the cost of treating to the level necessary to assure full protection would outweigh the risk to the resource.

Table 6-3 Existing Temperature Standards[a]	
Outfall Location	Temperature Standards
Willamette River from Newberg to confluence of Coast and North Forks, river mile 187:	No measurable increase shall be allowed outside of the assigned mixing zone (T >= 64°F); or more than 0.5°F increase due to a single source discharge when receiving water temperatures are 63.5°F or less; or more than 2°F increase due to all sources combined when stream temperatures are 62°F or less.
All tributaries that are salmonid fish producing waters:	No measurable increase shall be allowed outside of the assigned mixing zone (T >= 58°F); or more than 0.5°F increase due to a single source discharge when receiving water temperatures are 57.5°F or less; or more than 2°F increase due to all sources combined when stream temperatures are 56°F or less.
All tributaries that are non-salmonid fish producing waters:	No measurable increase shall be allowed outside of the assigned mixing zone, as measured relative to a control point immediately upstream from a discharge when stream temperatures are 64°F or greater; or more than 2°F increase due to all sources combined when stream temperatures are 62°F or less.

[a] From OAR Chapter 340, Division 41.

Table 6-4 Revised Temperature Standards	
A	No measurable surface water temperature increase resulting from anthropogenic activities is allowed: i. In a basin for which salmonid fish rearing is a designated beneficial use, and in which surface water temperatures exceed 64°F ii. In the Columbia River or its associated sloughs and channels from the mouth to river mile 309 when surface water temperatures exceed 68°F iii. In the Willamette River or its associated sloughs and channels from the mouth to river mile 50 when surface water temperatures exceed 68°F iv. In waters and periods of the year determined by the Department to support native salmonid spawning, egg incubation, and fry emergence from the egg and from the gravels in a basin which exceeds 55°F v. In waters determined by the Department to support or to be necessary to maintain the viability of native Oregon bull trout, when surface water temperatures exceed 50°F vi. In waters determined by the Department to be ecologically significant coldwater refugia vii. In stream segments containing federally listed Threatened and Endangered species if the increase would impair the biological integrity of the Threatened or Endangered population viii. In Oregon waters when the DO levels are within 0.5 mg/L or 10% saturation of the water column or intergravel DO criterion for a given stream reach or subbasin ix. In natural lakes
B	An exceedence of the numeric criteria identified in Ai) through Av) of this rule will not be deemed a temperature violation if it occurs when the air temperature during the warmest 7-day period of the year exceeds the 90th percentile of the 7-day average daily maximum air temperature calculated in a yearly series over the historic record.
C	Any source may petition the Commission for an exception to Ai) through Aix) of this rule for discharge above the identified criteria if: i. The source provides scientific information to describe how the designated beneficial uses would not be adversely impacted ii. A source is implementing all reasonable management practices or measures; its activity will not significantly affect the beneficial uses; and the environmental cost of treating the parameter to the level necessary to assure full protection would outweigh the risk to the resource
D	Marine and estuarine waters: No significant increase above natural background temperatures shall be allowed, and water temperatures shall not be altered to a degree which creates or can reasonably be expected to create an adverse effect on fish or other aquatic life.

Turbidity.

No more than a 10 percent cumulative increase in natural stream turbidities shall be allowed, as measured relative to a control point immediately upstream of the turbidity causing activity. However, limited duration activities necessary to address an emergency or to accommodate essential dredging, construction, or other legitimate activities which cause the standard to be exceeded, may be authorized by DEQ provided all practicable turbidity control techniques have been applied.

pH.

pH values shall not fall outside the range 6.5 to 8.5.

Bacteria.

Bacteria of the *coliform group* associated with fecal sources and bacteria of the *enterococci group* shall not exceed the criteria values described below. However, the DEQ may designate site-specific bacteria criteria on a case-by-case basis to protect beneficial uses. Site-specific values shall be described in and included as part of a water quality management plan.

- Freshwaters: The existing standard for fecal coliform bacteria is a log mean of 200 fecal coliform per 100 milliliters based on a minimum of five samples in a 30-day period with no more than 10 percent of the samples in the 30-day period exceeding 400 per 100 milliliter. The existing standard for enterococci states that a geometric mean of 33 enterococci per 100 milliliters based on no fewer than five samples, representative of seasonal conditions, collected over a period of at least 30 days. No single sample shall exceed 61 enterococci per 100 mL. The proposed standard indicates that for freshwaters other than shellfish growing waters, the discharge shall not exceed a 30 day log mean of 126 *Escherichia coli* (E. coli) per 100 mL. No single test sample shall exceed 406 E. coli per 100 mL. Note that a specific coliform bacteria is measured (E. Coli) and that enterococci is no longer included as a compliance measure.
- Bacterial pollution or other conditions deleterious to waters used for domestic purposes, livestock watering, irrigation, bathing, or shellfish propagation, or otherwise injurious to public health shall not be allowed.
- The proposed regulations also contain a prohibition on raw sewage discharges into the waters of the state. The commission may also

identify water bodies as water quality limited for bacteria, in which case implementation of bacteria management plans will be required of those sources the Commission determines to be contributing to the problem.

Total Dissolved Solids.

A concentration of 100 mg/L shall not be exceeded in the Willamette River and tributaries unless otherwise specifically authorized by DEQ upon such conditions as it may deem necessary to carry out the general intent of the rules and to protect the beneficial uses presented in Rule 340-41-442.

Toxic Substances.

Toxic substances shall not be introduced above natural background levels in the waters of the state in amounts, concentrations, or combinations which may be harmful, may chemically change to harmful forms in the environment, or may accumulate in sediments or bio-accumulate in aquatic life or wildlife to levels that adversely affect public health, safety, or welfare; aquatic life; wildlife; or other designated beneficial uses.

Mixing Zone.

A mixing zone is defined as a designated portion of a receiving water that serves as a zone of dilution where wastewaters and receiving waters mix thoroughly. The DEQ may suspend all or part of the water quality standards, or set less restrictive standards, in the defined mixing zone under the following conditions:

1. The water within the mixing zone shall be free of:

    - Materials in concentrations that will cause acute toxicity to aquatic life (bioassay testing required and approved by DEQ). Acute toxicity is lethality to aquatic life as measured by significant difference in lethal concentration between the control and 100 percent effluent in an acute bioassay test. Lethality in 100 percent effluent may be allowed due to ammonia and chlorine only when it is demonstrated on a case-by-case basis that immediate dilution of the effluent within the mixing zone reduces toxicity below lethal concentrations.

    - Materials that will settle to form objectionable deposits.

    - Floating debris, oil, scum, or other materials that cause nuisance conditions.

- Substances in concentrations that produce deleterious amounts of fungal or bacterial growths.

2. The water outside the boundary of the mixing zone shall:

   - Be free of materials in concentrations that will cause chronic (sublethal) toxicity. Chronic toxicity is measured as the concentration that causes long-term sublethal effects, such as significantly impaired growth or reproduction in aquatic organisms, during a testing period based on test species life cycle.
   - Meet all other water quality standards under normal annual low flow conditions.

The DEQ will describe the mixing zone in the wastewater discharge permit. The mixing zone will be defined by DEQ on the basis of receiving water and effluent characteristics. The mixing zone limits or outfall location may be changed if DEQ determines that the water within the mixing zone adversely affects any existing beneficial uses in the receiving waters.

The DEQ currently has a special committee that is developing new regulations regarding mixing zones for "effluent dominated streams." The new regulations being proposed may provide for alternative mixing zone definitions for discharges to relatively small receiving streams, if certain conditions are met.

Rickreall Creek Discharge Criteria

This section reviews and summarizes Rickreall Creek's proposed mass loads based on the results of the updated water quality study conducted by CH2M HILL. The water quality modeling efforts are summarized in Chapter 4. A summary of the proposed mass loads is presented in this section.

In an effort to analyze the effects of the Dallas WWTF discharge on Rickreall Creek, a model was developed to predict mass loads that could be discharged from the Dallas WWTF and still meet the water quality standards. The modeling effort was based on the proposed new "cool water" (nonsalmonid) stream classification. The modeling effort including results are presented in Chapter 4. The proposed mass loads for discharge to Rickreall Creek are presented in Tables 4-5 for summer conditions and Table 4-6 for winter conditions.

The modeling analysis showed that discharge to Rickreall Creek would be feasible at the mass loads and stream conditions presented in Tables 4-5 and 4-6 based on a treatment system that includes advanced biological treatment and filtration. For this same treatment system, excursions of the temperature standard are anticipated during the warm summer months. However, because the modeling shows that the in-stream temperatures may be higher without the effluent discharge, an exception to the temperature standard is proposed, to allow discharge during all months.

The in-stream TDS guideline of 100 mg/L is also expected to be exceeded. In fact, the upstream water quality in Rickreall Creek typically exceeds the guideline. Based on the TDS values anticipated to occur downstream from the WWTF discharge, no adverse impacts to the creek's beneficial uses are anticipated; therefore, no specific effluent limit is proposed for TDS.

Metal toxicity was also considered in Chapter 4 for the various treatment levels. With combined industrial and domestic flows, metal toxicity appears to significantly limit the periods when discharge may be possible with the treatment alternatives considered. Therefore, it was concluded that, for the Rickreall Creek discharge option, the industrial flows contributing the metals would need to be separated to make discharge feasible. Without the industrial flow, it is anticipated that the in-stream water quality criteria may be achieved in a defined mixing zone if a level of treatment equal to or greater than advanced biological treatment with filtration is selected. Because of the limited data available and assumptions made regarding metals removed, it is recommended that supplemental metals characterization be performed after implementation to verify the data and assumptions.

Willamette River Discharge Criteria

As a potential alternative discharge option, the DEQ analyzed the effects of the Dallas WWTF's discharge directly to the Willamette River. Near-field and far-field analyses were conducted. From the analyses, DEQ concluded that a Dallas WWTF discharge to the Willamette River just downstream of the confluence of Rickreall Creek would need to conform to the basin discharge standards or the existing mass load limits, whichever is more stringent. Because of projected increases in wastewater flow above the current permit design value of 2 mgd, and without establishing a new mass load, the City's current permit mass load limits will result in concentration limits for BOD and TSS, which would take precedence over the basin standards. The basin standards for the Willamette River for the reach in question are 10 mg/L BOD and 10 mg/L TSS summer and 30 mg/L BOD (25 mg/L $CBOD_5$) and 30 mg/L TSS winter. Therefore, the plant's current mass load and associated concentration limits presented in Table 6-5 will apply for a Willamette River discharge unless the City applies for new mass load limits. The concentration limits (presented in Table 6-5) are calculated based on a summer design flow of 3.07 mgd and winter design flow of 7.39 mgd.

Table 6-5 City of Dallas WWTF Existing Discharge Criteria and Mass Loads					
			Existing Mass Loads		
	Average Effluent Concentrations[a]		Monthly Average	Weekly Maximum	Daily Maximum
Parameters	Monthly mg/L	Weekly mg/L	lb/day	lb/day	lb/day
May 1 through October 31					
$CBOD_5$	7	10	170	250	330
TSS	7	10	170	250	330
FC/100 mL	200	400			
November 1 through April 30					
$CBOD_5$	5	8	330	500	670
TSS	5	8	330	500	670
FC/100 mL	200	400			

[a] Average effluent concentrations based on the following (projected) design flows:
May to October-3.07 mgd
November to April-7.39 mgd

Table 6-6 shows the proposed mass loads for a Willamette River discharge based on the projected design flows of 3.07 mgd summer and 7.39 mgd winter and the Willamette Basin standards for $CBOD_5$ and TSS.

Table 6-6 City of Dallas WWTF Proposed Discharge Criteria and Mass Loads for the Willamette River					
			Proposed Mass Loads		
Parameters	Average Effluent Concentrations[a]		Monthly Average	Weekly Maximum l	Daily Maximum l
	Monthly mg/L	Weekly mg/L	lb/day	lb/day	lb/day
May 1 through October 31					
$CBOD_5$	10	15	260	390	520
TSS	10	15	260	390	520
FC/100 mL	200	400			
November 1 through April 30					
$CBOD_5$	25	40	1,540	2,470	3,080
TSS	30	45	1,850	2,780	3,700
FC/100 mL	200	400			

[a] Average effluent concentrations based on the following (projected) design flows:
May to October-3.07 mgd
November to April-7.39 mgd

The DEQ's analyses at projected average flows concluded that ammonia and chlorine residual discharge limits will depend on the type of outfall diffuser selected. In the summer, a three-port type diffuser would be required to meet water quality standards if the effluent ammonia concentration is 15 mg/L. With a single port diffuser, an effluent ammonia concentration of 7 mg/L would be needed to achieve water quality standards. Because of the higher river flows during the winter months, the effluent ammonia concentration would not be critical with either a single or multiport diffuser.

In regards to chlorine residual, a single-port diffuser would limit the effluent concentration to 0.1 mg/L to achieve water quality. In the case of a three-port diffuser, the effluent chlorine residual would need to be less than 1 mg/L.

The effect of effluent pH on the river pH was found to be negligible. This applies to single as well as three-port diffuser designs.

Another issue considered for the discharge to the Willamette River option was metals toxicity. Although a detailed mixing zone analysis was not performed to evaluate metals toxicity, initial dilution calculations indicated that with an appropriate level of treatment, sufficient mixing could be achieved to meet water quality criteria within a mixing zone. The level of treatment anticipated would include biological treatment plus filtration. A detailed mixing zone analysis would need to be conducted to define the diffuser configuration to achieve the necessary mixing to meet the toxicity criteria.

Surface Water Discharge Comparison

For comparison, the discharge criteria and proposed mass loads for Rickreall Creek and the Willamette River have been summarized in Table 6-7. For both Rickreall Creek and the Willamette River discharge options, the proposed mass loads exceed the current permitted mass loads (except for the Rickreall Creek summer mass loads for stream flows less than 3 cfs). Therefore, for either discharge case, the City will need to request a mass load change from DEQ. Without a mass load change, the current mass loads would result in effluent concentration limits that would be in excess of what is necessary to meet the water quality criteria for dissolved oxygen, particularly during high stream flow conditions.

For Rickreall Creek, the proposed mass loads for summer conditions when creek flow is less than 3 cfs are actually more restrictive than the current mass loads. In addition, the mass loads for Rickreall Creek include a mass limit for ammonia that is not included in the current mass loads.

Requests for new mass loads are reviewed by the DEQ and the Environmental Quality Commission (EQC). The policies and guidelines for the review of mass load changes are outlined in OAR Chapter 340, Division 41, Section 026. Among requirements for a mass load increase to be approved, the changes may not result in violations of water quality and it must be shown that the cost of treatment to achieve the existing mass loads is not reasonable compared to the cost of treatment to meet the modified mass loads.

Wastewater Effluent Reuse Criteria

An alternative to direct river discharge of treated effluent during the dry weather period is to apply the treated effluent to meet irrigation demands at agricultural lands, golf courses, and parks. Effluent reuse can also be achieved by providing reclaimed water for specific nonagricultural industrial uses such as cooling water. The standards for effluent reuse in the State of Oregon are established by the DEQ through OAR Chapter 340, Division 55 (340-55).

Table 6-7
Comparison of Discharge Criteria and Proposed Mass Loads for Rickreall Creek and Willamette River Discharge

Parameter	Units	Rickreall Creek Discharge				Willamette River Discharge[a]	
		May - Oct[b]		Nov - April[c]		May - Oct[b]	Nov - April[c]
Stream Flow	Units	<3 cfs	> 3 cfs	<26 cfs	> 26 cfs	All Conditions	All Conditions
$CBOD_5$	lb/day	130	260	620	1,540	260	1,540
	mg/L	5	10	10	25	10	25
TSS	lb/day	130	260	620	1,850	260	1,850
	mg/L	5	10	10	30	10	30
NH_3-N	lb/day	25	51	123	615	N/A	N/A
	mg/L	1	2	2	10	N/A	N/A
BOD/TSS Removal Eff.[d]	%	85					
Bacteria (E. coli)	#/100 ml	126					
Chlorine Residual	mg/L	0.012				1	
pH		6.5 - 8.5					
Dissolved Oxygen	mg/L	6.5				N/A	
Temperature[e]	°F	No increase when T>64°F				No increase when T>68°F	

[a] Willamette River discharge criteria based on outfall modeling efforts conducted by DEQ and assumes three-port diffuser outfall located below confluence with Rickreall Creek.
[b] May through October loads and concentrations based on the projected dry weather design flow of 3.1 mgd.
[c] November through April loads and concentrations based on the projected wet weather design flow of 7.4 mgd.
[d] DEQ may consider an exemption to the 85 percent rule if the cost of treatment is unreasonable.
[e] An exception may be allowed if the designated beneficial uses are not adversely impacted.

Application Rates

The goal of a wastewater reuse program for agricultural use is to beneficially reuse the treated effluent by applying at rates to meet the crop's gross irrigation and nutrient requirements, which are commonly referred to as agronomic rates. The gross irrigation requirement is the total crop water demand adjusted for effective precipitation, irrigation application efficiency, and soil moisture storage. Table 6-8 summarizes the gross irrigation required for those crops commonly grown in the Willamette Valley near the City of Dallas. The gross irrigation required was calculated from the net irrigation requirement with an 80 percent application efficiency. The net irrigation requirement for the various crops was obtained from the Oregon State University report *Oregon Crop Water Use and Irrigation Requirements*, October 1992. Because of the intense management and appearance requirements for turf grass at golf courses, a 25 percent increase to the net irrigation requirement for pasture grass was used. The application efficiency for irrigation systems at golf courses is typically higher because of night irrigation; therefore, an efficiency of 85 percent was assumed.

Included in Table 6-8 is an estimated gross irrigation required for poplar trees planted at a density of 2,000 trees per acre. Detailed information on poplar tree characteristics is included in Appendix D. Within the past decade, more than 10,000 acres of poplar trees have been put into production in the Willamette Valley, largely due to the increasing demand for high-quality hardwood chips for pulp and other chip markets. The consumptive use and net irrigation requirements for the poplar trees were determined from ongoing research on water uptake of poplar trees based on age class and planting density. The gross irrigation requirement was calculated from the net irrigation required with an efficiency of 80 percent.

Table 6-8
Gross Irrigation Requirements of Various Crops for Willamette Valley Region (Ac-In/Ac)

								Poplar Trees (3 yrs old)	
Month	Turf Grass	Grass Pasture	Field Corn	Alfalfa Hay	Spring Grains	Winter Grains	Grass Seed (fall)	2,178 Trees/Acre	870 Trees/Acre
January	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
February	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
March	0.06	0.05	0.0	0.0	0.0	0.0	0.05	0.16	0.14
April	0.30	0.25	0.0	0.15	0.1	0.05	0.25	3.48	3.04
May	2.3	1.96	0.05	1.78	1.88	0.3	2.71	7.92	6.91
June	4.5	3.84	1.28	3.45	4.58	1.96	4.58	11.72	10.23
July	8.2	6.94	7.39	6.45	6.89	4.73	7.3	15.90	13.88
August	6.5	5.51	6.25	5.08	0.64	3.59	5.66	13.21	11.53
September	3.1	2.61	1.18	2.31	0.0	1.18	0.54	8.95	7.81
October	0.24	0.20	0.0	0.15	0.0	0.1	0.10	3.56	3.11
November	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
December	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Total	25.13	21.36	16.14	19.36	14.08	11.9	21.8	64.90	56.65

1. Net irrigation requirement is based on meeting 5 out of 10 years for the various crops, Willamette Valley Region. Source: *Oregon Crop Water Use and Irrigation Requirements*, October 1992.
2. Irrigation efficiency (E) = 80 percent for crops other than turf grass; 85 percent for turf grass.
3. Gross irrigation required = Net Irrigation Req'd/Efficiency.
4. Turf grass irrigation requirement applies to golf courses only and assumes a 25 percent increase over pasture grass because of the intense management of a golf course.
5. See Appendix D for detailed analysis on poplar tree water uptake.

The nutrient requirement is the amount of fertilizer, such as available nitrogen, phosphorus, and potassium, that is needed to obtain an optimum crop yield. The available nitrogen is made up of organic nitrogen, ammonia-nitrogen, and nitrate-nitrite nitrogen. Organic nitrogen is a long-term, slow-release fertilizer. As organic matter decomposes in the soil, microorganisms convert the organic nitrogen to inorganic ammonium nitrogen, a process called mineralization. Other organisms then convert the ammonium to nitrate; this process is called nitrification. The assumptions that will be used to determine the available nitrogen are:

- Ninety percent of mineralized organic nitrogen (TKN-ammonia nitrogen) will be available to the crop in the first year. The balance is lost to volatization.
- There will be a 50 percent loss of ammonia from volatization as a result of application with sprinklers; therefore, 50 percent will remain available.
- One hundred percent of nitrate-nitrite nitrogen will be available for crop use.

Table 6-9 summarizes the fertilizer requirements typically used in the Willamette Valley for various crops.

Table 6-9
Fertilizer Requirements of Various Crops for Willamette Valley Region (lbs/Ac/ Yr)

Nutrient	Grass Pasture/ Turf Grass	Field Corn	Alfalfa Hay	Spring Grains	Winter Grains	Grass Seed (fall)	Poplar Trees
Nitrogen	180-250	150-180	200-480	40-50	100-140	100-140	100-400
Phosphorus	50-75	20-30	20-30	40-60	30-60	30-60	60-150
Potassium	240-290	100	160-200	40	30-100	60	150-500

Notes:
1. Nutrient uptake rates for pasture/turf grass, alfalfa, and field corn were taken from EPA's *Process Design Manual for Land Treatment of Municipal Wastewater.*
2. Nutrient uptake rates for spring grains, winter grains, and grass seed were taken from OSU fertilizer guides.
3. Alfalfa hay does not require N fertilization, but is capable of utilizing the rates indicated.
4. See Appendix D for detailed information on poplar tree characteristics.

Seasonal Limitations/Storage Requirements

As seen in Table 6-8, there are seasonal limitations to an effluent reuse system because there is no crop water requirement during parts of the year (November through February). Most of the crops grown in the Dallas area will typically have a growing season from April through October.

Currently, City of Dallas discharges treated effluent into Rickreall Creek. Difficulties in meeting water quality standards in Rickreall Creek occur mostly during low streamflows, which typically occur over the summer from July through October. Because there is a low irrigation requirement during late September and October and low streamflows occur during the same time, a storage reservoir would likely be required to contain treated effluent that could not be used for irrigation or discharged into the stream. DEQ requires reservoirs designed for treated effluent to be lined to prevent any potential leaching into the groundwater, which might degrade the groundwater. The stored effluent could either be discharged into the river during the months when the streamflows would allow water quality standards to be met, or remain in storage to provide peak irrigation water requirements during the summer (i.e., July and August).

Treatment and Monitoring Requirements

Through OAR 340-55, DEQ has established treatment and monitoring requirements for potential agricultural and nonagricultural uses of the treated effluent. DEQ has classified reclaimed water into four categories and assigned a minimum degree of treatment required:

- Level I: Less than biological treatment or biological treatment without disinfection.
- Level II: Biological treatment plus disinfection.
- Level III: Biological treatment plus disinfection.
- Level IV: Biological treatment, clarification, coagulation, and filtration treatment plus disinfection.

Limits for total coliform (organisms/100 mL) and turbidity (NTU) have been established for the four categories. These standards serve as a general guideline for defining the anticipated water quality required for the various uses. In addition to the water quality limits, DEQ has provided standards for the minimum monitoring required for total coliform and turbidity based on the four categories. Table 6-10 summarizes the treatment and monitoring requirements for the four reuse categories. DEQ may include additional permit effluent limitations and/or permit conditions other than those shown in Table 6-10 if DEQ has reason to believe that the reclaimed water may contain physical or chemical contaminants that would impose potential hazards to the public or environment.

General Requirements

A number of general requirements have been outlined in DEQ's Chapter 340, Division 55 rule. These requirements address agricultural and nonagricultural uses that are acceptable based on the effluent water quality level, irrigation system, public access requirements, and buffer zones for irrigation. Table 6-11 summarizes these general requirements based on the different levels of reclaimed water quality.

Agricultural and Nonagricultural Uses

Agricultural uses are divided into general agricultural and specific agricultural uses. General agricultural uses cover irrigation for food crops; processed food crops; orchards and vineyards; fodder, fiber, and seed crops; and pasture for animals. Specific agricultural uses range from general produce (such as lettuce and carrots) to Christmas trees. Nonagricultural uses cover irrigation at parks, playgrounds, golf courses, cemeteries, highway medians, and other landscape irrigation.

Table 6-10 Treatment and Monitoring Requirements for Agricultural Use of Reclaimed Water[a]				
	Reuse Category Level Minimum Degree of Treatment Required			
-	**I**	**II**	**III**	**IV**
	Less than biological treatment or biological treatment without disinfection	**Biological treatment plus disinfection**	**Biological treatment plus disinfection**	**Biological, clarification, coagulation, and filtration treatment plus disinfection**
Reclaimed Water Quality				
Total coliform (#/100 mL)				
7-day median	No limit	23	2.2	2.2
Two consecutive samples	No limit	240	No limit	No limit
Maximum	No limit	No limit	23	23
Turbidity (NTU)				
24-hour mean	No limit	No limit	No limit	2
5% of the time during any 24-hour period	No limit	No limit	No limit	5
Minimum Monitoring Requirements				
Total coliform	Not required	One sample/week	Three samples/ week	Daily
Turbidity	Not required	Not required	Not required	Hourly or continuous

[a] From OAR Chapter 340, Division 55.

Because the existing WWTF could produce a Level II quality effluent, the potential uses range from the irrigation of agricultural crops processed before human consumption or crops not for human consumption, to irrigation at golf courses without "contiguous" residences. Level IV effluent is the least restrictive with respect to the ways in which the treated effluent can be beneficially reused, and is the most costly to produce.

Public Access and Buffer Zones

DEQ provides guidelines on public access and buffer zones for irrigation systems depending on the effluent water quality level category. As illustrated in Table 6-11, public access requirements for the different effluent levels range from "prevented" (fences, gates, locks) to no direct public contact during the irrigation cycle. The current level of effluent from the City of Dallas WWTF approaches Level II. The disinfection limit is the only criteria the plant is not currently required to meet, although the plant is capable of meeting the Level II standard. Public access under a Level II effluent quality reuse program must be "controlled." This means that irrigation using this effluent can only occur on rural or nonpublic lands that limit the potential for direct public contact. The site used would also require signs indicating the use of reclaimed water in the irrigation system. This level of public access control would be similar for Level III effluent quality; however, the requirement would be reduced to no restrictions except prevention of direct public contact during the irrigation cycle under a reuse program using Level IV effluent quality.

Table 6-11
Agricultural Use Allowed With Different Levels of Reclaimed Water Quality**

	Reuse Category Level Minimum Degree of Treatment Required			
	I	II	III	IV
	Less than biological treatment or biological treatment without disinfection	**Biological treatment plus disinfection**	**Biological treatment plus disinfection**	**Biological, clarification, coagulation, and filtration treatment plus disinfection**
General Agricultural Uses - Irrigation Method Allowed				
Food crops	*	*	*	Surface or spray
Processed food crops[b]	*	Surface or spray	Surface or spray	Surface or spray
Orchards and vineyards	Surface[c]	Surface[c]	Surface[c]	Surface or spray
Fodder, fiber, and seed crops[d]	Surface or spray	Surface or spray	Surface or spray	Surface or spray
Pasture for animals	*	Surface or spray[e]	Surface or spray[c]	Surface or spray
Specific Agricultural Uses - Irrigation Method Allowed				
Produce—general (lettuce, carrots, etc.)	*	*	*	Surface or spray
Tomatoes (unprocessed)	*	*	Surface[c]	Surface or spray
Tomatoes[b] (processed—no gleaning)	*	Surface or spray	Surface or spray	Surface or spray
Strawberries	*	*	*	Surface or spray
Sugar beets	*	Surface or spray	Surface or spray	Surface or spray
Grain—for human consumption	*	*	Surface[c]	Surface or spray
Trees and vines	Surface	Surface or spray[f]	Surface or spray[f]	Surface or spray
Nuts	*	*	Surface or spray	Surface or spray
Other crops: sod	*	*	Surface or spray	Surface or spray
Ornamental nursery stock	*	*	Surface or spray	Surface or spray
Christmas trees	*	Surface or spray	Surface or spray	Surface or spray
Firewood: customer cut	*	Surface or spray	Surface or spray	Surface or spray
Firewood: not customer cut	Surface or spray	Surface or spray	Surface or spray	Surface or spray
Nonagricultural Uses - Irrigation Method Allowed				
Parks, playgrounds, schoolyards, golf courses with contiguous residences	*	*	*	Surface or spray[g,h]
Golf courses without contiguous residences	*	Surface or spray[g,h]	Surface or spray[g,h]	Surface or spray[g,h]

Table 6-11
Agricultural Use Allowed With Different Levels of Reclaimed Water Quality**

	Reuse Category Level Minimum Degree of Treatment Required			
	I	**II**	**III**	**IV**
	Less than biological treatment or biological treatment without disinfection	**Biological treatment plus disinfection**	**Biological treatment plus disinfection**	**Biological, clarification, coagulation, and filtration treatment plus disinfection**
Cemeteries, highway medians, landscapes without frequent public access	*	Surface or spray[g,h]	Surface or spray[g,h]	Surface or spray[g,h]
Unrestricted Impoundments	*	*	*	Surface or spray[g,j]
Restricted Impoundments	*	*	Surface or spray[g,j,k]	Surface or spray[g,j]
Landscape Impoundments	*	Surface or spray[g,j,k]	Surface or spray[g,j,k]	Surface or spray[g,j]
Other Requirements				
Public access	"Prevented" (fences, gates, locks)	"Controlled" (signs, rural or nonpublic lands)	"Controlled" (signs, rural or nonpublic lands)	No direct public contact during irrigation cycle
Buffers for Irrigation	Surface: 10 ft Spray: Site-specific	Surface: 10 ft Sprays 70 ft	Surface: 10 ft Spray: 10 ft	None Required

* = Not allowed.
** = From OAR Chapter 340, Division 55.
[a] Not acceptable for root crops or crops where edible parts touch the ground.
[b] Processed food crops must undergo extensive commercial, physical, or chemical processing sufficient to destroy pathogenic agents. Processing does not include washing, pickling, fermenting, or milling.
[c] Edible portion of plant does not contact the ground.
[d] Not for human ingestion.
[e] No animals shall be on the pasture during irrigation.
[f] No spraying within 30 days of fruit formation.
[g] Signs shall be posted around the perimeter and other locations indicating that reclaimed water is used and is not safe for drinking, and, in the case of effluent quality Levels II and III, for body contact.
[h] Reclaimed water shall be applied in a manner so that it is not sprayed onto areas where food is prepared or served, or onto drinking fountains.
[i] Reclaimed water shall be applied in a manner so that it is not sprayed within 100 feet of areas where food is prepared or served, or where drinking fountains are located.
[j] There shall be no disposal of reclaimed waters into surface or groundwaters without authorization by an NPDES or WPCF permit.
[k] Aerators or decorative fixtures that may generate aerosols shall not be used unless approved in writing by the DEQ.

Buffer zones for surface and spray irrigation systems are intended to protect public health and the environment. As with the public access requirements, the buffer zones are least restrictive for Level IV effluent quality. Assuming the City of Dallas WWTF achieves Level II effluent quality, the buffer zones for surface (flooding and overland flow) and spray irrigation systems would be 10 and 70 feet, respectively. DEQ may reduce the buffer distances, as identified in Table 6-11, if it determines that alternative controls would adequately protect public health and the environment.

Institutional Issues

A number of institutional issues will need to be addressed to implement any wastewater reuse option. Because the wastewater treatment plant owner is solely responsible and liable to DEQ for meeting the requirements of these rules, any reclaimed water released for use on property not under direct control of the treatment plant owner will require a legally enforceable contract between the treatment plant owner and the user. The contract should include the following as a minimum:

- Quality and maximum quantity of wastewater to be released for use
- The specific use(s) for the reclaimed water
- Maximum quantity of reclaimed water used on an annual basis
- A condition in the contract specifying the parties in the contract are responsible for compliance with the DEQ rules
- A provision in the contract allowing the treatment plant owner to cease providing reclaimed water if the DEQ or the treatment plant determine the regulations are not being met
- A condition that requires the user of the reclaimed water to report to the treatment plant owner any and all violations of the terms of the rules or contract

In addition to the contract, the treatment plant owner will need to submit a reclaimed water use plan that describes the proposed reuse system and indicates the means for complying with these regulations.

Other Reuse Requirements

Other requirements to consider in designing a wastewater reuse system are alarm devices, standby power, redundancy, cross-connection, and construction and marking of piping, valves, and other portions of the reclaimed water system. As outlined in OAR 340-55, alarm devices are used to provide the necessary warning of loss of power and/or failure of process equipment essential to the proper operation of the WWTF. This requirement is consistent with the design guidelines of any WWTF, whether or not a wastewater effluent reuse system is implemented. In addition to the alarms, appropriate redundancy is required to provide a sufficient level of treatment facilities and monitoring equipment to effectively prevent inadequately treated water from being used or discharged to public waters.

There is no cross-connection between a potable water system and the distribution system carrying the reclaimed water unless the connection is through either an unrestricted air gap or a reduced pressure principle backflow preventer. This backflow preventer must be tested and serviced professionally at least once per year. Unless approved by DEQ, construction and marking of piping, valves, and other portions of the reclaimed water system must conform with requirements outlined in the "Guidelines for Distribution of Nonpotable Water" of the California-Nevada Section of the American Water Works Association. In general, the requirements that have not already been discussed are:

- Pipe Separation: Potable pipelines must maintain a separation of 10 feet horizontally and one foot vertically from parallel reclaimed water (nonpotable) pipelines. When potable pipelines cross reclaimed water pipelines, the potable water pipeline must maintain a separation of 1 foot above the reclaimed water pipeline.
- Pipe and Valve Identification: Reclaimed water pipeline must be adequately marked with a warning tape. The warning tape should be prepared with specified purple color and printing with the words CAUTION: RECLAIMED WATERLINE. Above ground or exposed facilities should be marked to differentiate reclaimed water pipelines from potable water systems or wastewater facilities.

Biosolids Management Criteria

Both federal and state regulations apply to land application of biosolids from WWTPs. Federal regulations include 40 CFR 257 and approved 40 CFR, Part 503 regulations. The Oregon regulations include the DEQ Oregon Administrative Rules Chapter 340, Division 50. Since the passing of the federal 503 regulations, the state has prepared and passed amendments to OAR Chapter 340, Division 50, that adopt provisions outlined in the 503 regulation.

For disposal of sludge as interim cover or as fill at a solid waste landfill, federal regulations 40 CFR, Part 258 apply. If the sludge is incorporated in the final cover for the landfill, the 503 regulations would still apply.

State regulations take precedence over federal regulations, where applicable. In some instances, state regulations may impose more stringent requirements than federal regulations. However, federal regulations apply if no state regulations are declared.

Regulations

Federal Regulations

Current federal regulations for land treatment of biosolids are listed in the Federal Register under 40 CFR, Part 257, "Criteria for Classification of Solid Waste Disposal Facilities and Practices," dated September 13, 1979. In the past, Part 257.3-5 has regulated solid waste application to food chain crops; however, these regulations have been considered too general. Therefore, new regulations under 40 CFR, Part 503 were required by Section 405 (d) of the Clean Water Act of 1977 (as amended by the Water Quality Act of 1987).

The new regulations under 40 CFR, Part 503 have gone through several scientific community and public reviews and were released as final in late 1992.

State Regulations

In December 1984, DEQ defined rules for the land application and disposal of sewage treatment plant biosolids and biosolids-derived products, including septage (Oregon

Administrative Rules Chapter 340, Division 50). These regulations are currently in the process of being updated to conform to the adopted federal regulations.

Biosolids Quality

According to current state and new federal regulations (40 CFR, Part 503), biosolids samples should be analyzed for the parameters listed in Table 6-12.

The nitrogen, phosphorus, and potassium content of the sludge are important when applying biosolids at agronomic rates. Nitrogen content can vary significantly in the biosolids depending on its source, age, and history. The concentration levels of these nutrients should be determined from samples taken immediately prior to biosolids application because stored biosolids can lose nitrogen rapidly. Therefore, it is important that the real nitrogen content of the biosolids is known to avoid under- or over-application. The assumptions used to determine the available nitrogen in the biosolids are:

- 30 percent of the organic nitrogen will be available
- 50 percent of the ammonia nitrogen will be available
- 100 percent of the nitrate-nitrite nitrogen will be available

Table 6-12
Sampling Requirements for the EPA 40 CFR, Part 503 Sludge Regulations[a]

Parameter	Units
Arsenic	mg/kg dry weight
Beryllium	mg/kg dry weight
Cadmium	mg/kg dry weight
Chromium	mg/kg dry weight
Copper	mg/kg dry weight
Lead	mg/kg dry weight
Mercury	mg/kg dry weight
Molybdenum	mg/kg dry weight
Nickel	mg/kg dry weight
Selenium	mg/kg dry weight
Zinc	mg/kg dry weight
Total Nitrogen	% dry weight
Nitrate nitrogen	% dry weight
Ammonia nitrogen	% dry weight
Phosphorus	% dry weight
Potassium	% dry weight
pH	standard units
Total solids	% dry weight
Volatile solids	% dry weight
PCBs[b]	µg/kg

[a] From 40 CFR, Part 503.
[b] PCBs include PCB-1016,-1221,-1232,-1242,-1248,-1254, and -1260.

Under the new federal regulations 40 CFR, Part 503, ceiling concentrations, cumulative pollutant loading rates, alternate pollutant limits or "clean biosolids," and annual pollutant loading rate have been established for 11 heavy metals. Table 6-13 shows the acceptable levels for land application. These rates are used to determine site life, which is the number of years that biosolids with a uniform metal content could be applied to a specific site.

Site Identification and Approval

Prior to approving any potentially sensitive application site (with respect to residential housing, runoff potential, or groundwater threat), DEQ may require an opportunity for public comment and public hearing. A statement of land use compatibility from the responsible planning jurisdiction should accompany requests for approval of biosolids land application sites. New sites or expansion of existing sites must be proposed to DEQ prior to use. Newly approved sites become part of the sludge management plan.

Table 6-13
New Federal Regulations (40 CFR, Part 503) for Heavy Metals[a]

Parameter	Ceiling (mg/kg)	Cumulative Loading (kg/ha)	Alternate Pollutant Limits (mg/kg)	Annual Pollutant Loading Rate (kg/ha/yr)
Arsenic	75	41	41	2.0
Cadmium	85	39	39	1.9
Chromium	3,000	3,000	1,200	150
Copper	4,300	1,500	1,500	75
Lead	840	300	300	15
Mercury	57	17	17	0.85
Molybdenum	75	18	18	0.90
Nickel	420	420	420	21
Selenium	100	100	36	5.0
Zinc	7,500	2,800	2,800	140

[a] From 40 CFR, Part 503.

Site criteria for land applying biosolids includes physical geographical features (geological formation, flood plan proximity, and groundwater and surface water proximity, topography, and soils), and method of application. Oregon DEQ's specific criteria are outlined in Table 6-14.

Special Management Considerations

Land receiving biosolids for agricultural use requires special management considerations. These relate to access to the site, types of crops grown, plant nutrient rates, timing and duration of biosolids land application (site life and seasonal constraints), and grazing restrictions.

Access

Controlled access to bulk Class B domestic biosolids and domestic septage land application sites is required for a minimum of 12 months following surface application of solids. Controlled access means that public entry or traffic is unlikely. Rural private land is assumed to have controlled access while parks or other public lands may require fencing to ensure control.

Table 6-14
Oregon DEQ Site Criteria for Biosolids Application[a]

Parameter	Criteria
Geology	• Must have a stable formation
Flood Plain	• Restricted period of application and incorporate biosolids if in a flood plain
Groundwater	• At time of application, the minimum depth to permanent groundwater is 4 feet; the minimum depth to temporary groundwater is 1 foot
Topography • Slope less than or equal to 12 %	• Liquid biosolid application with appropriate management to eliminate surface runoff • Surface application of dewatered or dried biosolids
• Slopes up to 30%	• Direct incorporation of liquid biosolids into the soil
Soils	• Minimum rooting depth of 24 inches • No rapid leaching • Avoid saline or alkali soil
Method of application and proximity to water bodies	• Buffer strips may be required to protect water bodies. Size depends on method of application and proximity to sensitive area (variable with local conditions and left to discretion of DEQ), as described below; • Direct injection: no limit required • Truck spreading: less than 200-foot buffer strip • Spray irrigation: 350- to 500-foot buffer strip • Near ditch, pond, channel, or waterway; greater than 50- foot buffer strip. • Near domestic water source or well: greater than 200-foot buffer strip.

[a] From OAR Chapter 340, Division 50 as amended.

Crops

As a general rule, crops grown for human consumption should not be planted for at least 14 months after bulk Class B biosolids or domestic septage application. If the edible parts will not be in contact with the biosolid-amended soil, or if the crop is to be treated or processed prior to marketing such that pathogen contamination is not a concern, this requirement may be waived.

No restrictions on planting time are required where Class A biosolids derived products are land applied to sites used for the cultivation of fresh market vegetables.

Nutrient Loading

Biosolids application to agricultural land should not exceed the annual nitrogen loading required for maximum crop yield and is, therefore, managed according to its fertilizer value. Biosolids may be applied to approved sites above agronomic rates on a one-time basis or less than once per year as long as runoff, nuisance conditions, or groundwater contamination do not occur. Nitrogen accumulation from higher than agronomic rates and annual nitrogen use will determine the acceptable loading rate and frequency.

Site Life

Site life is important in planning because sites generally have a limited application life based on the chemistry of the soil and the metals loading from the biosolids. Site life is calculated by dividing lifetime biosolids loading limits based on the most limiting constituent by the annual application rate.

Seasonal Constraints

In western Oregon, where soil damage may occur from application equipment traffic in the wet season, biosolids application should be restricted to the dry season. The main consideration in land applying on sloping ground is avoiding surface runoff and soil erosion.

Grazing Restrictions

Grazing animals should not be allowed on pasture or forage nor should livestock feed be harvested for 30 days after application of bulk Class B biosolids or domestic septage.

Reliability and Redundancy Criteria

New or expanding treatment works are required to meet minimum standards for mechanical, electrical, fluid systems, and component reliability in accordance with EPA's policy. This is to ensure that the treatment facilities will operate effectively on a day-to-day basis and that capabilities are provided for satisfactory operation during power failures, flooding, peak loads, equipment failures, and maintenance shutdowns. These reliability and redundancy standards are important to ensure that unacceptable degradation of the receiving water will not occur as a result of the interrupted operation of specific treatment operations or processes. In that regard, standards have been established for three classes of wastewater treatment works.

The reliability class appropriate for the Dallas WWTF will be dependent on the effluent disposal receiving stream or body of water. For discharge to Rickreall Creek, it is anticipated that reliability Class II will be appropriate for the Dallas WWTF, since the discharge from the existing and future facility is not near a drinking water intake, shellfish waters, an area used for water contact sports, or in a dense residential area, all of which are criteria for reliability Class I. However, for the discharge to the Willamette River, it is anticipated that Class I reliability would be more appropriate because of the relative high use of the river for water contact sports in the area being considered for an outfall.

Table 6-15 contains the minimum backup requirements for plant components that may be provided at the Dallas facility in accordance with the EPA's Works Design Criteria, Reliability Class I for sewage treatment plants. In addition to the standards listed in the table, unit operations will be designed to pass the peak hydraulic flow with one unit out of service. Also, mechanical components in the facility will be designed to enable repair or replacement without violating the effluent limitations or causing control diversion.

Table 6-15 is not specific to the Dallas WWTF, and all elements presented are not necessarily included in the existing or future facilities. The most significant difference between Class I and Class II reliability is that for secondary sedimentation only 50 percent design capacity is required with one unit out of service for Level II reliability. Also, backup components are not mandatory for wastewater treatment systems used to provide treatment in excess of typical biological treatment and disinfection.

Table 6-15
Reliability Class I Requirements

Plant Component	Requirement
Raw Sewage Pumps	Peak flow with largest unit out of service. Peak flow is defined as the maximum wastewater flow expected during the design period of the treatment works.
Mechanical Bar Screens	One backup with either manual or mechanical cleaning (manual cleaning if only two screens)
Grit Removal	Minimum of two units.
Primary Sedimen-tation	50% of design flow capacity with largest unit out of service. Design flow is defined as the flow used as the design basis of the component.
Activated Sludge Process	A minimum of two equal volume basins; no backup basin required.
Aeration Blowers	Supply the design air capacity with the largest unit out of service; provide a minimum of two units.
Air Diffusers	Isolation of largest section of diffusers (within a basin) without measurably impairing oxygen transfer.
Secondary Sedimentation	75% of design flow capacity with largest unit out of service. Design flow is defined as the flow used as the design basis of the component.
Disinfectant Contact Basin	50% of the design flow with largest unit out of service. Design flow is defined as the flow used as the design basis of the component.
Effluent Pumps	Peak flow with largest unit out of service. Peak flow is defined as the maximum wastewater flow expected during the design period of the treatment works.
Electrical Power	Two separate and independent sources of electrical power shall be provided, either from two separate utility substations or from a single substation and a works-based generator. Designated backup source shall have sufficient capacity to operate all vital components, critical lighting, and ventilation during peak flow conditions, except that components used to support the secondary processes need not be included as long as treatment equivalent to sedimentation and disinfection is provided.

The reliability criteria for sludge processes presented in Table 6-16 are also based on the guidance offered in the EPA's Works Design Criteria.

Table 6-16
Sludge Handling System Reliability

System Components	Required Capacity/Backup
Sludge Holding Tanks	The volume of the holding tank shall be based on the expected time necessary to perform maintenance and repair of the component in question.
Anaerobic Sludge Digestion	At least two digestion tanks shall be provided. At least two of the digestion tanks provided shall be designed to permit processing all types of sludges normally digested.
Aerobic Sludge Digestion	A backup basin is not required. At least two blowers or mechanical aerators shall be provided. Isolation of largest section of diffusers without measurably impairing oxygen transfer is allowed.
Sludge Pumping	Pumps sized to pump peak sludge quantity and maintain velocities above 2 fps. Provide a minimum of 2 pumps.

Chapter 7
Wastewater Treatment, Storage, and Effluent Disposal Options

CHAPTER 7

WASTEWATER TREATMENT, STORAGE, AND EFFLUENT DISPOSAL OPTIONS

Introduction

Several options are available to meet the regional water quality objectives and balance the wastewater system needs of the City of Dallas, now and in the future. Options are available for each aspect or component of the comprehensive wastewater system. These components are broadly categorized as treatment, storage, and disposal. All three categories are interrelated, and apply separately to liquid and biosolids processing.

This section deals exclusively with liquid processing. Available options in each category are identified and screened stepwise. Options shortlisted after the preliminary screening steps are used to define four "system options." Each system option is referred to by its component disposal option, and may include suboptions. The system options and suboptions are then developed in greater detail, including preliminary sizing and definition of design elements. The design information is used for a comprehensive evaluation of the system options, which includes estimation of design, construction, and O&M costs; a general environmental impact assessment; and noncost considerations. Selection of the recommended liquid processing option is based on the overall ranking of each option with respect to the comprehensive evaluation criteria.

This chapter is organized into sections as follows:

- Introduction
- Preliminary Options Screening
- System Options Development
- Cost Evaluation
- Noncost Evaluation Criteria
- Noncost Evaluation of System Options
- System Option Selection

Preliminary Options Screening

Options considered are described by category in the following subsections. These categories include:

- Effluent storage and disposal
- Liquid treatment

No-action Option

The No-action option would result in noncompliance with DEQ's Stipulation and Final Order and would prevent renewal of the City's NPDES permit. This option is not recommended and is not considered further.

Effluent Storage and Disposal Options

Among other options, surface water bodies within a reasonable distance of the plant are considered as potential receiving waters for the plant effluent. These include Rickreall Creek, Basket and Hayden Sloughs, and the Willamette River. The effluent disposal and storage options and suboptions are discussed below.

Discharge to Rickreall Creek

This is the current disposal method practiced by the existing plant. This disposal option is directly affected by the reclassification of Rickreall Creek described in Chapter 4. The discharge period would depend on water quality standards and level of treatment provided. Based on the discussion in Chapter 4, this option is considered further as a viable alternative.

Rickreall Flow Augmentation with Willamette River Water Diversion. This suboption is designed to allow year-round discharge to Rickreall Creek by pumping water from the Willamette River to a point in the creek upstream of the plant outfall. Sufficient flow would be diverted at various times of the year to ensure that the creek flow at the outfall permits plant effluent discharge throughout the year. However, this suboption is easily eliminated in favor of discharge to the Willamette River, discussed below. Conveyance of plant effluent to the Willamette River is clearly the lower-cost option because peak effluent flow is lower than peak diversion flow, resulting in a smaller pipe with lower construction cost. Also, plant effluent is pumped against a lower static head, resulting in lower equipment and O&M costs. The Willamette River has less stringent effluent quality requirements, which results in lower treatment costs, and discharge is possible year-round. The diversion suboption is therefore considered no further.

Rickreall Flow Augmentation with Increased Reservoir Storage Capacity. This suboption provides another way to augment Rickreall Creek flow by increasing the storage capacity of the Mercer Reservoir or constructing additional storage, and releasing the water stored during wet weather months to augment flow during dry weather periods. This suboption is being currently investigated in separate studies and will be considered further when the results of the studies are available.

Discharge to the Willamette River

This option involves construction of an effluent pump station at the plant, a pipeline from the plant to the Willamette River, and a new river outfall. Although this option permits discharge to the river year-round, the effluent is also available for seasonal beneficial reuse, because it meets Level II standards at a minimum. A major advantage of this option is that no effluent storage is required.

Conveyance and Outfall. The three outfall sites and four pipeline routes considered for Willamette River discharge are shown in Figure 7-1. Two possible pipeline routes j:*nfs*dallas*cvo33407*33407f71.dgn

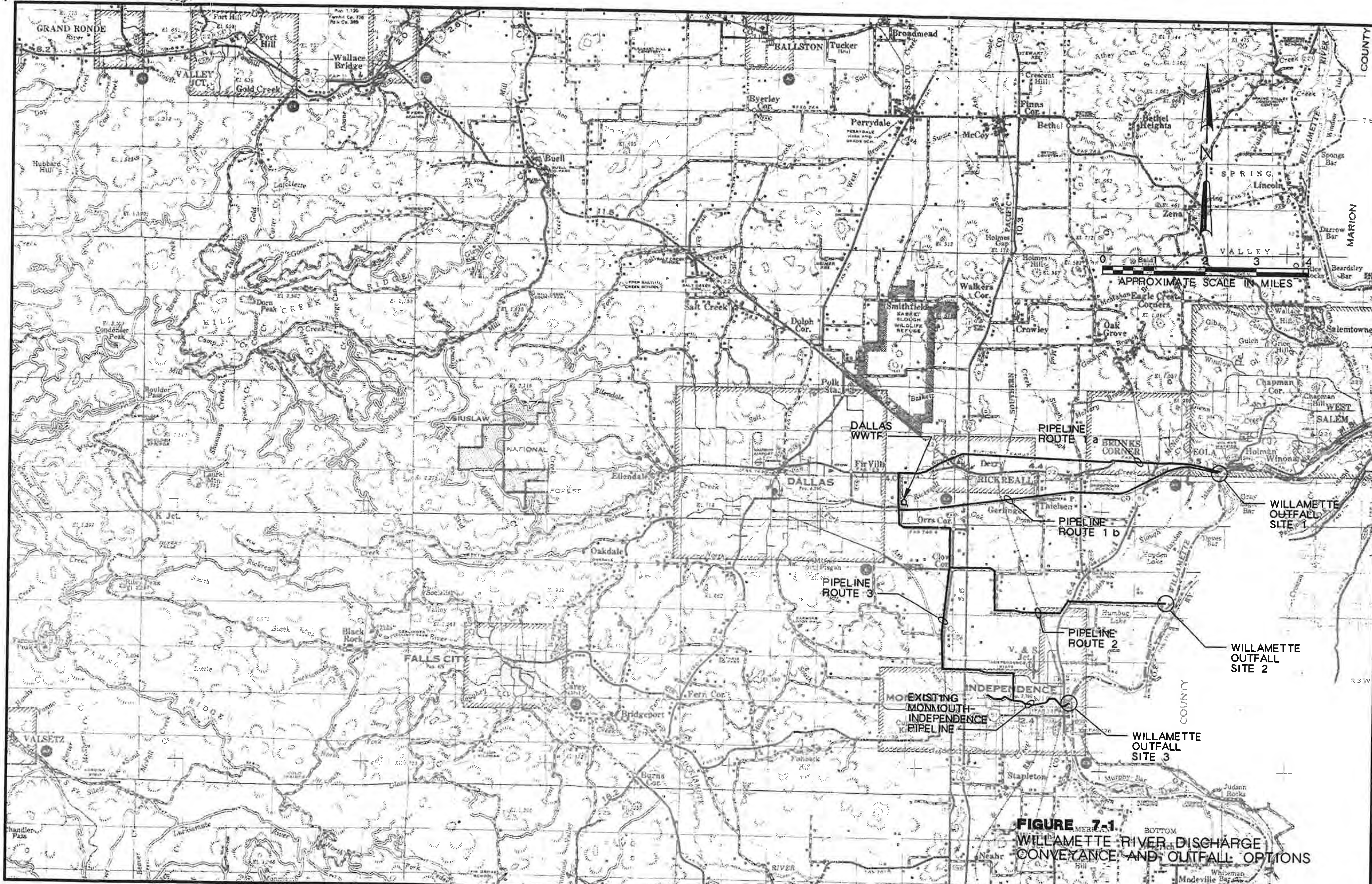


FIGURE 7-1
WILLAMETTE RIVER DISCHARGE CONVEYANCE AND OUTFALL OPTIONS

(Routes 1a and 1b) can connect the plant to Outfall Site 1, while a single conveyance option is associated with each of Sites 2 and 3 (Routes 2 and 3).

Outfall Site 1 is located near the confluence of Rickreall Creek and the Willamette River (river mile 88). The closest landmark is Eola Inn. The river is about 400 feet wide at this site. The site appears to offer enhanced mixing and dispersion characteristics, as preliminary investigations of the site revealed no back eddies or other unusual currents. Current velocities range from 0.8 feet per second (fps) near the river bottom to 1.2 fps near the surface. Developments at the site include a boat launching area and some houses, and a gravel operation on the east Willamette bank upstream of the confluence. None of these should conflict with the construction of an outfall. The west river bank is very steep and is composed of clay. The west shoreline is relatively stable with some minor erosion. Access points for this site are undeveloped. This outfall can be reached via Pipeline Route 1a or 1b. Route 1a heads due north from the plant and east along Highways 223 and 22. Route 1b heads south from the plant and then east along the Southern Pacific Railroad.

Outfall Site 2 is located at river mile 91.5, near the east end of Halls Ferry Road. Although this site has easy access, the maximum depth is only 6 feet and current velocity is approximately 3.4 fps. Further, an outfall at this site could interfere with the Emil Marx Memorial Fishing Hole nearby, and diffuser ports could interfere with boat traffic. This outfall would be served by Pipeline Route 2, which is longer than the other three routes. This site is therefore not considered further.

Outfall Site 3 is located at river mile 94.8, near the Ash Creek-Willamette River confluence at Independence. An existing outfall at this site serves Monmouth and Independence. Although this site has easy access, a maximum river depth of 15 feet, and current velocities of 1.2-1.3 fps, it is not a desirable location for an outfall because of back eddies. Options for Dallas include construction of a second outfall, or a connection to the existing Monmouth-Independence conveyance pipeline near the intersection of Ash Creek and Gun Club Road, with or without modifications to the existing outfall designed to minimize the effect of the eddies. Pipeline Route 3, which would connect to the existing Monmouth-Independence pipeline, is the shortest route. However, in addition to the undesirable outfall location, this option complicates implementation and monitoring of regulatory compliance because of the joint use by two additional cities. Therefore, this option is also eliminated from further consideration.

Discharge to Baskett or Hayden Sloughs

Discharge to these sloughs is subject to the Dilution Rule [OAR 340-41-455-(1)-(f)], which determines permissible waste loadings in proportion to the receiving water flow. The water quality analysis presented in Chapter 4 estimates the flows in both sloughs to be too low to provide significant dilution. Effluents discharged to these sloughs must therefore be treated to an extremely high quality at considerable expense. Conveyance to the Hayden Slough would cost at least as much as conveyance to the Willamette River, with significant additional treatment costs. Dissolved oxygen levels in the sloughs are currently approximately 5 mg/L (see Chapter 4), which is below the stream standard of 6 mg/L. This precludes any waste load discharge at all. Discharge to Rickreall Creek incurs lower treatment costs and virtually no additional conveyance costs. Baskett Slough is classified as a wetland and is therefore protected by even stricter controls. Slough discharge is therefore not a viable option.

Irrigation Reuse

Wastewater reclamation through irrigation could reduce or eliminate river discharge and provide a number of other benefits to the local economy and environment. Initial contacts with farmers in the area indicated a high level of interest in this water source. Currently, many farmers in the area have a limited choice of crops because they lack irrigation water, especially during dry weather.

Poplar Irrigation

A relatively new and innovative technology that uses effluent to irrigate poplar tree plantations has shown considerable promise as a positive effluent management technique. It is similar to land application to field crops, but offers several additional advantages:

- Infrequent crop harvests minimize interruption of the land application system's treatment capacity.
- Irrigation and monitoring equipment need not be designed around frequent field operations, such as tillage, planting, and harvesting.
- Poplars provide a deep and stable root zone for beneficial reuse of the effluent
- Poplars tolerate a wide range of soil moisture and chemical conditions.
- Poplar wood is a high-value, nonfood, nonfeed crop, offsetting operation and maintenance costs.
- Poplars can consume a large amount of irrigation water, and do so during early and late periods of the growing season, when treatment capacity can be critical. This larger consumptive use also reduces the overall land area required.

The combination of several of these factors allows for the development of a deep, well-regulated root zone for water storage. To an extent, root zone moisture can be managed as a regulating reservoir, thereby reducing the need for construction of costly storage ponds or tanks.

The City has therefore elected to consider land application to poplar in lieu of field crops during this facilities planning effort. Two main alternatives are considered as potential poplar tree reuse systems.

No Discharge With Winter Storage and Summer Irrigation: This alternative consists of developing a poplar tree effluent reuse system to handle all of the 2020 flows. A storage reservoir would be required to store effluent flows during the nongrowing season to be beneficially reused during the growing season (April through October).

Rickreall Creek Discharge with Summer Irrigation during July through October: This alternative consists of developing a poplar tree effluent reuse system to handle 2020 flows during July, August, September, and October. The effluent flows during the remaining months could be discharged into Rickreall Creek. A separate industrial reuse system to remove the industrial flow to the treatment plant would be required in this alternative in order to meet discharge compliance.

Demand-based Irrigation

The Willamette River discharge option is available year-round. However, the treated effluent for this option would still be suitable and available, from the conveyance pipeline, for irrigational use at the users' choice. Effluent storage is not necessary for this option because year-round discharge is permissible.

Citywide Dual Distribution

Wider reclaimed water distribution and greater flexibility of use may become necessary to generate or maintain a consistent reclaimed water market demand in the future, especially for the no discharge option. This can be accomplished by providing a citywide dual reclaimed water distribution system for the entire population of the City, in addition to the targeted distribution to the designated irrigation sites. Such a dual distribution system will incur substantial additional cost, especially in a built-up urban area such as the City of Dallas. This option is therefore considered no further.

Year-round Rickreall Creek Discharge

The year-round discharge option involves treating the effluent to a level that would allow continued year-round discharge to Rickreall Creek via the existing outfall. In addition to highly advanced treatment facilities, some effluent storage capacity would be required to store substandard effluent resulting from temporary process upsets, until it could be returned to the plant for adequate treatment during low flow periods of stable operation.

Liquid Treatment Options

Several options and suboptions are considered for some liquid treatment processes, while a single option is appropriate for others. The processes and any associated options are discussed below.

Preliminary and Primary Treatment

Dry pit centrifugal pumps and vertical bar screens are selected for influent pumping and preliminary treatment, respectively. The low strength of the Dallas wastewater limits the efficiency of the biological secondary treatment process. Because primary sedimentation would further reduce the quantity of substrate available to the microorganisms responsible for biological secondary treatment, it is not included in this evaluation.

Aeration

Feasible aeration process options for treatment plants without primary clarification include conventional activated sludge with anoxic selector, anoxic/aerobic nitrification-denitrification, anaerobic/anoxic/aerobic biological nutrient removal (BNR), oxidation ditches, and sequencing batch reactors (SBRs). To allow meaningful comparison between system options, only variations of the plug-flow activated sludge process (anoxic selector, nitrification-denitrification, and BNR) are considered in the present evaluation. BNR will be required for year-round Rickreall Creek discharge, while anoxic selectors (designed for sludge settleability and/or nitrification-denitrification) should suffice for the other disposal options. Other feasible activated sludge technologies such as oxidation ditches and SBRs deviate from typical plug-flow activated sludge systems to varying degrees. Oxidation ditches typically incur high capital costs and would automatically preclude possible reuse of the existing aeration basins at Dallas. They are therefore not considered further in this evaluation. A more detailed analysis of SBRs relative to plug-flow systems requires better definition of the other components of the system. SBRs may therefore be evaluated more appropriately during preliminary design of the treatment facility.

Secondary and Tertiary Clarification

Circular center-feed secondary clarifiers are selected. Solids contact tertiary clarifiers with alum and polymer addition to the secondary effluent are selected for year-round Rickreall Creek discharge only. In addition to phosphorus removal, tertiary chemical treatment is intended to provide enhanced metals removal.

Wetlands

Constructed wetlands have been used as a treatment technology to polish treated wastewater effluents and provide additional removal of organic wastes and nutrients. Wetlands by themselves are not a disposal strategy, but rather an alternative treatment process. For organic waste removal, a constructed wetlands treatment system could potentially be used in place of effluent filtration following conventional secondary treatment. Wetlands would require significantly more land than filtration facilities and would be less reliable and operationally flexible than filtration. Replanting and harvesting requirements could also result in substantial O&M costs. However, the higher cost may be justified and offset by the potential ability of the constructed wetland to combine multiple treatment processes such as nutrient removal, metals removal, dechlorination, and suspended solids removal. The wetlands treatment option is discussed in more detail in Chapter 9.

Coagulation/Flocculation and Tertiary Filtration

Prefiltration coagulation with a polymer followed by in-line static mixers is provided for all disposal options requiring filtration. Conventional deep bed, continuous backwash deep bed (moving bed type), and continuous backwash shallow bed (traveling bridge type) are the three major filtration options available. Year-round Rickreall Creek discharge will require the use of conventional deep bed filters, while the 85 percent BOD removal requirement for Willamette River discharge and the effluent quality required for Rickreall Creek winter discharge with summer irrigation can be accomplished with continuous backwash deep bed filters. These filtration options will therefore be evaluated with their respective disposal options. No benefit is obtained from filtration for the no discharge option with winter storage and summer irrigation, since the unfiltered effluent meets all land application standards for poplar irrigation and does not adversely affect soil or water quality. Therefore, no filtration is provided in evaluating this option.

Residual Ammonia Removal

Biological nitrification may not consistently achieve the low effluent ammonia/total nitrogen levels required for year-round discharge to Rickreall Creek. Physical and/or chemical means must therefore be used to meet the seasonally varying effluent ammonia limits for Rickreall Creek. Available physical/chemical options are air stripping, ion exchange, and breakpoint chlorination. However, effluent from nitrifying systems does not contain ammonia concentrations high enough to provide adequate motive force for either air stripping or ion exchange to be feasible. Breakpoint chlorination is therefore selected as the residual ammonia removal method.

Disinfection

Chlorine (chlorine gas or sodium hypochlorite) and UV radiation are the disinfection options considered. The fact that chlorination can accomplish the dual objectives of disinfection and ammonia removal leads to the selection of chlorine disinfection for the present evaluation. Chlorine gas is eliminated based on safety concerns and the need to provide scrubbing equipment and chemicals. Sodium hypochlorite is selected for further consideration in this evaluation. However, chlorine gas or UV may still be considered if the selection criteria change in the future, or if the selected system option does not require extensive residual ammonia removal.

Dechlorination

Dechlorination may not be a concern if UV disinfection is selected in the future. With chlorine disinfection, dechlorination is required only for options involving Rickreall Creek discharge. Commonly used dechlorinating chemicals include sulfur dioxide and sodium bisulfite. Sulfur dioxide is not considered a desirable dechlorination chemical because of safety concerns (similar to those associated with chlorine gas) and the related need to provide scrubbing equipment and chemicals. Sodium bisulfite is therefore the selected chemical.

Microfiltration and Reverse Osmosis (MF/RO)

Hollow fiber microfiltration followed by reverse osmosis membrane technology may be required to meet the extremely stringent effluent quality requirements for year-round discharge to Rickreall Creek.

Temperature Adjustment

To conform to the Rickreall Creek water quality standards, cooling of the treated effluent prior to post-aeration may be a periodic requirement for options involving Rickreall Creek discharge. Cooling towers or chillers are provided for temperature adjustment as necessary.

Post-aeration

Post-aeration to meet the effluent dissolved oxygen standards will be required for Rickreall Creek discharge. Surface mechanical aerators installed in an effluent channel will be provided for this purpose.

System Options Development

Four major liquid system options emerge from the preliminary screening. An overview of these options and their selected components is presented in Table 7-1. Some components are common to all system options while others vary across the options. The components are developed in greater detail in this section.

Table 7-1 Liquid System Options and Components				
	System Option			
Component	**(1) No Discharge Winter Storage/ Summer Irrigation**	**(2) Rickreall Discharge/ Summer Irrigation**	**(3) Willamette Discharge/ Demand Irrigation**	**(4) Year Round Rickreall Discharge**
Treatment				
Influent pumping	Dry pit centrifugal pumps			
Screening	Vertical bar screens with intermittent rake			
Alkalinity adjustment	None	Soda ash	None	Soda ash
Aeration	Conventional activated sludge, anoxic selector	Nitrification-Denitrification	Conventional activated sludge, anoxic selector	BNR
Secondary clarification	Circular, center feed			
Alum/polymer addition	None			Present
Tertiary clarification	None			Present
Coagulation/ flocculation	Polymer, in-line static mixer			Part of tertiary clarification
Tertiary filtration	None	Continuous backwash, deep bed	Continuous backwash, deep bed	Conventional deep bed
MicroFiltration (MF) Reverse Osmosis (RO)	None			Present
Residual ammonia removal	None	None	None	Breakpoint chlorination
Disinfection	Sodium hypochlorite			
Dechlorination	None	Sod. bisulfite	None	Sod. bisulfite
Post-aeration	None	Surface	None	Surface
Storage and Disposal				
Intermediate pumping	Present	None	None	None
Effluent storage	Present	None	None	Present
Effluent pumping	Present			
Conveyance	Railroad	Existing to outfall, railroad to irrigation	a. Hwy 22 b. Railroad	Hwy 223
Distribution	Targeted	Targeted	None	None
Outfall	None	Existing, rehabilitated	West Salem	Existing rehabilitated
Separate irrigation of metal-bearing industrial waste	None	Poplar irrigation	None	None

Description of System Options

System Option 1: No Discharge: Winter Storage with Summer Irrigation

This option represents the lowest level of treatment and the largest irrigation system of the four options. This low level of treatment is acceptable for this option because it does not discharge to any receiving stream. The major difference in this option and the option presented as "Perennial Irrigation" in the August 1994 Facility Plan is that the plant effluent would be used for irrigation and commercial tree harvesting under the current Option 1, instead of being applied to farm- or cropland as previously planned. This change allows System Option 1 to accommodate the metals-bearing industrial waste within the municipal collection and treatment system, without the need for a separate industrial waste management system.

System Option 2: Rickreall Discharge with Summer Irrigation

Stream water quality and mixing zone modeling discussed in Chapter 4 revealed that based on revised stream classification, discharge to Rickreall Creek would not be possible with the level of treatment originally intended for this option. The major modification made to keep this option feasible is the incorporation of separate collection, storage, conveyance, and irrigation disposal for the industrial waste. A sewer sampling program revealed that most of the industrial waste can be easily separated for this purpose. Poplar irrigation disposal would be used for both the industrial waste and treated WWTF effluent (summer only) in this option. Also, the revised aeration basin design minimizes process oxygen and supplemental alkalinity requirements by providing a higher anoxic volume and mixed liquor recycle capability for enhanced denitrification.

System Option 3: Willamette Discharge with Demand Irrigation

The irrigation component of this option remains optional, at the users' discretion, and the target irrigation sites remain farm- and cropland. Continuous backwash deep-bed filtration and adequate chlorine residual would provide Class IV effluent suitable for irrigation of all crops grown within the area.

System Option 4: Year-round Rickreall Creek Discharge

This option is a modification of the option presented as "Potable Reuse" in the August 1994 Facility Plan. The objective was modified to provide an effluent quality that would allow year-round discharge to the Creek based on revised classification, instead of targeting indirect potable reuse by conveyance to the Mercer Reservoir. In keeping with this change in objective, granular activated carbon (GAC) treatment is replaced with MF/RO, advanced processes designed to help remove TDS, turbidity, and metals. Additionally, a cooling system is added to the treatment scheme to meet the Rickreall Creek discharge temperature criterion year-round. This option thus provides the highest level of treatment by including all processes necessary to treat all influent wastewater, including industrial wastes, to year-round creek discharge standards. No separate disposal of industrial waste is provided.

Criteria described in Chapter 6 are used to perform preliminary sizing and develop basic design information.

Preliminary sizing calculations are based on current and projected future plant influent flow and loading data. The future projections are based on an analysis of historical data and I/I, as described in Chapters 3 and 5, respectively. The design flow conditions used in the sizing calculations are included in Appendix C. Loadings corresponding to these flow conditions were used for process design.

The proposed **treatment** process sizing and design information is presented in Appendix C. A brief description is provided below for each process.

Influent Pumping

The influent pumping design is common to all system options. Future WWPIF (16.1 mgd) can be pumped with the largest pump out of service. Appropriate turndown is provided for pumping low flows.

Screening

The screening design is common to all system options. Three vertical bar screens are provided in parallel: two are 1 foot wide, and the third is 2.5 feet wide. The two 1-foot-wide screens can accommodate the future WWMMADF of 7.4 mgd and are provided with mechanical rakes, while the wider screen, required only for higher flows up to the WWPIF of 16.1 mgd, has a manual rake. Channel depth and widths are designed to maintain the approach velocity between 1 to 3 fps under all conditions.

Aeration

Aeration is provided in plug flow activated sludge reactors with anoxic selectors and/or BNR processes. The design is varied to achieve the objectives of each system option. Three, four, or five rectangular plug flow units are provided, with associated aeration equipment (fine bubble diffusers, centrifugal blowers) and anoxic mixers. Target MLSS is 3,000 mg/L. The nitrification-denitrification and BNR systems (for winter and year-round Rickreall Creek discharge, respectively) also include mixed liquor recycle (MLR) pumps and alkalinity (soda ash) feed equipment to allow complete nitrification. Alum feed equipment for chemical phosphorus removal is provided for year-round discharge.

Secondary Clarification

Two 105-foot-diameter circular units or three 85-foot units are provided depending on redundancy requirements of each system option. Related equipment includes RAS, WAS, and scum pumps, and sludge and scum removal mechanisms.

Advanced Chemical Phosphorus and Metals Removal and Tertiary Clarification

Two 80-foot-diameter solids contact tertiary clarifiers are provided in conjunction with tertiary alum and polymer addition equipment, only for year-round Rickreall discharge. Alum feed equipment is shared between aeration and advanced tertiary treatment. Tertiary sludge pumps and sludge removal equipment is also included.

Coagulation/Flocculation

Polymer feed equipment is provided for winter Rickreall Creek and Willamette River discharge, along with chemical injection nozzles, followed by two 12-inch-diameter in-line static mixers. No separate designated tankage is provided for flocculation. No polymer addition is necessary for the no discharge option because no filters are necessary.

Tertiary Filtration

Six continuous backwash deep bed filters are provided for winter Rickreall Creek and Willamette River discharge, while four conventional deep bed filters each are provided for year-round Rickreall Creek discharge. No filtration is provided for irrigation reuse with no discharge. Design filtration rate at future WWMMADF (7.4 mgd) is 4.0 gpm/ft^2 for conventional deep bed filters and 4.5 gpm/ft^2 for continuous backwash deep bed filters. Additional design elements include backwash pumps, air scour blowers, backwash supply reservoir, and spent backwash surge tank.

Disinfection

Two 3-pass chlorine contact tanks (100 feet per pass, 300 feet/tank), 7.5 feet wide (per pass), and 11 feet deep are provided for all system options. This provides a total contact volume of approximately 0.34 mg and a detention time of 65 minutes at future WWMMADF (7.4 mgd). Sodium hypochlorite feed equipment is sized for a dose of 5 mg/L as Cl_2 for the no discharge and winter Rickreall Creek discharge options. This provides adequate disinfection for discharge and poplar irrigation purposes. Level 4 disinfection for demand irrigation and breakpoint chlorination for residual ammonia removal for year-round Rickreall Creek discharge require doses up to 10 mg/L as Cl_2. Two 12-inch-diameter in-line static mixers are provided downstream of hypochlorite addition.

Dechlorination

Sodium bisulfite feed equipment is sized to provide stoichiometric dechlorination doses for winter and year-round Rickreall Creek discharge only. The post-aeration channel downstream of chlorination (described below) is selected as the bisulfite addition point to allow use of the aerators for the dual purpose of aeration and providing positive chemical mixing.

Temperature Adjustment

Temperature adjustment with a cooling tower system is provided for the year-round Rickreall Creek discharge option only .

Post-aeration

Five 30-hp surface turbine aerators are spaced 25 feet apart in a channel 75 feet long, 25 feet wide, and 10 feet deep. Post-aeration is required for the Rickreall Creek discharge and potable reuse options. In addition to raising the dissolved oxygen, the aerators provide the rapid, positive mixing required for effective use of the dechlorination chemical.

Microfiltration and Reverse Osmosis (MF/RO)

This combination of advanced treatment processes is provided only for the year-round Rickreall Creek discharge option. Polypropylene hollow fiber MF membranes, polypropylene prefilter cartridges with 5 micron nominal retention rating, and cellulose acetate RO membranes are used. A description of the facilities included in this TDS reduction facility (TRF) is provided below.

Microfiltration System

The continuous-flow microfiltration process uses hollow fibers rated at a pore size of 0.2 µm. These fibers are bundled and enclosed in interlocking tubes. Treated effluent is applied to the tubes, and filtrate passes to the center of the fibers and is collected for further treatment. The MF system is designed to remove nearly all suspended solids from the RO feedwater so that these solids do not foul the RO modules and degrade performance. MF treatment will provide a high-quality RO feedwater typically having a turbidity below 0.2 NTU and a silt density index (SDI) of 2 or less. Bacteria and other microorganisms greater than 0.5 microns in size should be completely removed.

Suspended solids and microorganisms are retained on the outside of the fibers and are removed from the system by periodic gas-assisted backwashing. During backwash, an MF assembly is taken off line, and compressed air is pulsed through the membrane bundles in reverse to blow attached solids off the fibers, followed by a flush with feed water to discharge the backwash solids. Backwashing is automatically initiated either by pressure drop measured across the fibers, or by a timer. For filtered tertiary wastewater effluent, gas-assisted backwashing might be initiated automatically for brief periods approximately every 20 minutes. The backwash water requirements are typically approximately 8 percent of the rated feed water capacity.

Reverse Osmosis System

Reverse osmosis uses pressure to force water through a semipermeable membrane. Dissolved solids pass through the membrane to varying degrees, depending on the exact membrane type and the molecular size of the dissolved solid. Typical RO membranes can reject up to 90 percent of the total dissolved solids applied to them. RO membranes most typically are spiral-wound flat sheets, which are placed in tubular pressure vessels. A number of pressure vessels are typically set up in parallel, with the reject water (concentrate) collected and passed through a second stage of fewer parallel vessels, which may be followed by a third stage of pressure vessels. Water passing through the membranes of the various stages (permeate) is blended together to form a single product water. Use of three stage systems allows product water recovery of 85 percent or higher of the feed flow. Acid and other antiscalant chemicals must be added to the feed water to prevent scaling of salts on the concentrate side of the membranes as system recoveries are increased.

Building

All equipment associated with the TRF as described above would be located in a single building, referred to as the TRF building. The building would contain the following systems:

- Chemical storage and feed
- MF system including membrane backwashing, and chemical cleaning subsystems

- MF backwash water storage and pumping
- MF filtrate storage and pumping
- RO feedwater chemical conditioning
- Cartridge filtration
- RO system, including pumps, RO trains, and chemical cleaning system

A brief description of each storage and disposal component of the system options is provided in the following sections.

Intermediate Pumping

Intermediate pumping is required only for winter storage with summer irrigation, to pump effluent from the treatment plant to the storage reservoir. This is a low head application with variable flow rate. Intermediate pumping design information is presented in Appendix C.

Storage

Storage is required only for the winter storage with summer irrigation option. Storage requirements are determined by performing a water balance analysis and are presented below in the section on poplar tree reuse.

Effluent Pumping

Effluent pumping is located at the plant for the Willamette River discharge and Rickreall Creek discharge with summer-only irrigation options, and at the storage reservoir for the winter storage with summer irrigation option. No effluent pumping is required for year-round Rickreall Creek discharge. Effluent pumping design information is included in Appendix C.

Poplar Tree Reuse System

Feasibility and implementation costs of a poplar tree reuse system depend on the acreage of suitable application sites available within a reasonable distance from the treatment plant. Based on the alternatives discussed previously, poplar tree alternatives for the different system options were refined in greater detail. The specific items covered were:

- Water balance and storage analysis
- Constituent loading
- Identification of potential sites
- Implementation issues
- Poplar tree reuse system component development

Water Balance and Storage Analysis

The availability of reclaimed water and the water uptake capacity (irrigation demand) must be defined in order to analyze the water balance for the various alternatives. The available reclaimed water is the amount that is not discharged to Rickreall Creek. The demand for irrigation water depends on the density and age class of the poplar trees grown.

Available Reclaimed Water. Future flows are assumed to be approximately equal to the plant influent flows, which are projected to the year 2020 (see Chapter 3). Table 7-2 summarizes the estimated monthly reclaimed water flows for the year 2020 and the available reclaimed water for the various alternatives considered.

Table 7-2
Estimated Reclaimed Water Flows (mgd)

Month	2020			
	Average Monthly WWTF Flow (mgd)	Alt 1 No Discharge with Winter Storage and Summer Irrigation	Alt 2 Rickreall Creek Discharge with Summer Irrigation During July through October	Industrial Flow (Required with Alt 2)
January	5.78	5.78	0	0.2
February	6.19	6.19	0	0.2
March	5.03	5.03	0	0.2
April	3.82	3.82	0	0.2
May	2.94	2.94	0	0.2
June	2.53	2.53	0	0.2
July	2.17	2.17	2.17	0.2
August	2.21	2.21	2.21	0.2
September	1.96	1.96	1.96	0.2
October	2.15	2.15	2.15	0.2
November	3.4	3.4	0	0.2
December	5.07	5.07	0	0.2
Volume/Yr				
MG	1,316	1,316	261.36	73.2
AC-FT	4,038	4.038	802	224.6

Irrigation Demand. Consumptive use of three-year-old poplar trees at a high planting density (2,000 trees per acre) was estimated to be about 58 inches of water in the third year of growth during a year with average weather (based on data from Oregon State University, and from Licht et al., 1995, see Appendix D). Three-year-old trees were assumed to determine the site size, since growth in consumptive use begins to level off at this age. This implies that the plantation must be established 3 years before it will achieve design capacity. High planting densities allow for the rapid establishment of a closed tree canopy, a large density of leaf area, and therefore the highest achievable levels of consumptive use of water. The average net irrigation required for poplar was developed from a relationship between the orchards' consumptive use and net irrigation required for this region (provided by the OSU crop water and irrigation guide). This requirement was adjusted by an irrigation efficiency of 80 percent to obtain an average gross irrigation required. The resulting monthly consumptive use, net irrigation requirements, and gross irrigation required for the poplar trees used in the water balance analysis are listed in Table 7-3.

Table 7-3 Poplar Tree Gross Irrigation Requirements			
	2,200 trees per acre; 3 year old trees (inches)		
Month	Consumptive Use	Net Irrigation Required	Gross Irrigation Required
January	0	0	0
February	0	0	0
March	2.67	0.13	0.16
April	4.99	2.78	3.48
May	7.59	6.34	7.92
June	9.61	9.38	11.72
July	12.04	12.72	15.0
August	9.9	10.57	13.21
September	7.11	7.16	8.95
October	3.43	2.85	3.56
November	1.07	0	0
December	0	0	0
Total	58.4	51.91	64.89

Results of the Water Balance. Table 7-4 summarizes the water balance analysis results. Detailed results of the water balance analyses are in Appendix D. Under the no discharge alternative, the entire reclaimed water flow from January through December would be used for irrigation. This requires a storage facility to store the flow during the non-growing season for irrigation use during the growing season. This alternative requires conventional treatment with no industrial reuse component. The results of the water balance indicated a need for a storage volume of 2,300 acre-feet and approximately 900 acres of irrigated poplar trees.

Alternative 2 assumes advanced treatment with filtration and allows discharge during January through June and November through December. The remaining months would require summer irrigation (July through October). In addition, an industrial reuse component would be required to allow the discharge during the designated months. The results of the water balance indicated approximately 250 acres of irrigated poplar trees with no storage for the wastewater effluent system. Because the poplar trees are deep-rooting, the soil moisture profile will be managed to maximize the storage capacity, therefore eliminating the need for a storage facility. The industrial reuse component will require approximately 70 acres of irrigated poplar trees with an 80 acre-feet storage facility.

A field visit to the project area and review of maps helped determine the general location of the storage reservoir. Proximity to the WWTF is an important consideration at this level of analysis. Therefore, the land closest to the WWTF is considered as the primary location for any of the storage facilities required in the alternatives, including the storage required for the industrial flow. Additional work would be required to adequately determine the best available reservoir site. The land required for the storage would be 230 acres for Alternative 1 and 8 acres for Alternative 2. Because of the topography of the area, only embankment ponds were considered suitable for storage. Embankment ponds are typically constructed with small embankments or berms to completely enclose a relatively flat area. DEQ has indicated in previous projects, as well as this one, that a liner would likely be required for the storage reservoir to prevent groundwater contamination.

Table 7-4 Water Balance Summary					
Alternative	Irrigated Acres—Poplar Trees (acres)	Effluent Applied/ Reused (mg)	Potential Supplemental Water Required (mg)	Rickreall Creek Discharge (mg)	Maximum Storage (Ac-ft)
No Discharge, Winter Storage, and Summer Irrigation	900	1,316.6	0	0	2,300
Rickreall Discharge and Summer Irrigation (July-Oct)	250	386.9	0	930.43	Potential Operational Storage
Industrial Reuse	70	73.2	29.43	0	80

Constituent Loading

Tables 7-5 and 7-6 are summaries of the quality constituents from the WWTF and industrial flows. Constituent loadings for BOD, suspended solids, available nitrogen, phosphorus, and metals were estimated from the water balance analysis. These constituent loadings assess the potential impacts of the irrigation option on the environment. Tables 7-5 and 7-6 outline the constituent loadings for the WWTF effluent and industrial effluent, and a discussion of each constituent follows.

Table 7-5 WWTF Constituents				
	Quality (mg/L)			
	Alt 1 No Discharge with Winter Storage and Summer Irrigation		Alt 2 Rickreall Creek Discharge with Summer Irrigation During July through October	
Constituents	Summer	Winter	Summer	Winter
BOD	10	20	5	10
TSS	10	20	5	10
TDS	362	237	300	200
TKN	7	15	3	6
Ammonia Nitrogen	5	10	.5	1
Nitrate/Nitrite	3	5	3	5
Phosphorus	1.2	1.2	1	1

Table 7-6 Industrial WWTF Constituents					
	Quality (mg/L) Industrial Flow				
Constituents	Feb 2, 1995	May 23, 1995	Nov 30, 1995	Dec 6, 1995	Dec 11, 1995
BOD			720		
TSS			96		
TDS			1,200-5,200		
TKN					
Ammonia Nitrogen			54		
Nitrate/Nitrite					
Phosphorus			.22		
Potassium					220
Arsenic	<0.005	<0.005		<0.005	<0.005
Boron					0.14
Cadmium	<0.005	<0.005		0.012	<0.005
Calcium					22
Chromium	<0.005	<0.005		ND	<0.005
Copper	2.673	3.218		2.52	2.3
Iron	197.5	165.1		117	
Lead	0.175	0.031		0.15	0.15
Magnesium	113.3	71.6		107	310
Mercury	<0.001			<0.001	
Molybdenum	<0.005			<0.005	0.02
Nickel	<0.01			1.76	1.4
Selenium	<0.002			<0.002	<0.002
Sodium					660
Silver	<0.01			<0.01	
Zinc	0.195			0.165	0.45

WWTF Loading Analysis. BOD and suspended solids in reclaimed water usually are found at concentrations far below the soil system's capacity to remove them. As shown in Table 7-7, annual application rates are approximately 183 to 193 pounds BOD/ac/yr and 183 to 193 pounds TSS/ac/yr. In terms of daily application, the highest BOD or TSS loading rate to the poplar trees would be less than 1 pound per acre per day.

Available nitrogen is removed from the reclaimed water principally by poplar tree uptake. The projected annual nitrogen loadings to the poplar trees would be approximately 71 to 142 lb./acre/yr. These loading rates are well below the nitrogen requirements of poplar trees. In general, phosphorus reacts readily with the solid and solution phases of the soil. It absorbs the soil particles or precipitates, and is therefore less mobile than nitrogen. The extent of these reactions depends on the texture, mineralogy, and chemistry of the soil. In general, phosphorus removal ranges from above 50 percent in coarse (sandy) soils to nearly 100 percent in fine (clay to clay loam) soils. The capacity of soils to absorb phosphorus varies and can be renewed by plant uptake and other processes. As seen in Table 7-7, the phosphorus loading rates are well below the annual phosphorus requirements.

Table 7-7 Constituent Loadings with WWTF Reclaimed Water							
Water Reclamation Options	**2020 Applied Effluent (ac-ft)**	**Constituent Loading from Reclaimed Water**				**Typical Nutrient Requirements (lb/ac/yr)**	
		BOD (lb/ac/yr)	**TSS (lb/ac/yr)**	**Nitrogen (lb/ac/yr)**	**Phosphorus (lb/ac/yr)**	**Nitrogen**	**Phosphorus**
Alternative 1	4,039.8 (1,316.6 mg)	183	183	142	14.6	100-400	60-150
Alternative 2	1,186.25 (386.6 mg)	197	197	70.9	12.9	100-400	60-150

Industrial Loading Analysis. Table 7-8 is a summary of the industrial loading analysis. The BOD and TSS loading is higher than what is experienced with the WWTF effluent. Special management considerations may be required in order to get proper treatment of the BOD and TSS. In addition, supplemental water is required and therefore would reduce the lbs/acre/yr of BOD and TSS applied.

The nitrogen and phosphorus loading is well below the recommended requirements for the poplar trees. The potassium loading is approximately 1,900 lbs/ac/yr according to the water quality information provided. This is higher than the recommended requirements for poplar trees. However, additional uptake may be available from the poplar trees. Potassium occurs abundantly in nature and it is not uncommon to have soils containing 40,000 to 60,000 lbs per acre. Additional analysis would be performed during a demonstration phase to quantify any concerns about this level of potassium loading to the specific areas being considered for land application.

Table 7-8 also provides a summary of the metals loading and site life. According to this analysis, the site life projections for the industrial reuse system is approximately 73 years based on estimated copper levels.

There are no guidelines or limitations associated with the TDS loading. The main concern is about the forms of TDS being applied. Much of the TDS could be made of micronutrients that would be consumed by the tree. Chloride and sodium are the main forms of TDS that are a concern and, depending on the loading and concentration, could result in salts leaching to the groundwater. Additional analysis would be performed during a demonstration phase to quantify and address any concerns relating to the TDS loading.

Identification of Potential Sites

For land application of reclaimed water to be suitable, a site must provide the appropriate landform, soils, hydrology, and present and future land use. To be adequately treated, reclaimed water must infiltrate the soil and remain above the water table long enough for beneficial use of the nutrients and water to occur. Runoff must be minimal and the aerated portion of the soil must be sufficiently thick. Steepness, slow permeability, impervious layers, high groundwater, and frequent flooding are all conditions that can make land non-irrigable with reclaimed water.

For successful implementation, the users must commit to long-term irrigation with reclaimed water to justify water delivery to the property. This commitment would be formalized through a written agreement.

Initial reviews of the area surrounding the WWTF reveal sufficient agricultural land, with average parcel sizes ranging from 50 to 100 acres.

Table 7-8
Industrial Loading Analysis

Constituents	Industrial Flow Applied = 73.2 mg per year; land area = 70 acres				
	Concentration (mg/L)	lbs/acre/yr	Est. Uptake (lbs/ac/year)	Accumulation Limit (lbs/acre)	Site Life (years)
BOD	720	6,279			
TSS	96	837			
TDS	1,200 to 5,200	10,465 to 45,350			
Available N		235	100-400		
TKN					
Ammonia N	54				
Nitrate/Nitrite					
Phosphorus	.22	1.91	60-150		
Potassium	220	1,918	150-500		
Arsenic	<0.005	<0.044		36.49	829
Boron	0.14	1.22			
Cadmium	<0.005	<0.044		34.71	8,676
Calcium	22	191			
Chromium	<0.005	<0.044		2670	60,682
Copper	2.67	23.2	5	1335	73.4
Iron	160	1395			
Lead	0.13	1.14		267	234
Magnesium	150	1,308	30		
Mercury	<0.001	<0.009		15.13	1681
Molybdenum	<0.005	<0.044		16.02	364
Nickel	1.05	0.92		373.8	406
Selenium	<0.002	<0.017		89	5,235
Sodium	660	5,756	3		
Silver	<0.01	<0.087			
Zinc	0.27	2.35	10	2492	ND

The following items were reviewed during the identification of potential irrigation sites:

- Soil characteristics
- Assessment of user interest

Only a general review of these items was performed. Additional work would be required to refine the information presented here.

Soil Characteristics

Soils in the area have been classified in the Soil Conservation Service (SCS) Soil Survey of Polk County. Figure 7-2 presents the general soils map for the project area. These soils have been grouped into associations of soil series that are found at various positions on the dominant landform. A description of the significant soil associations follows.

The predominant soil mapping unit found within the project area is the Woodburn-Willamette soil association. These soils are moderately well drained and poorly drained silt loams on the terraces of the Willamette Valley. These soils formed in silty alluvial deposits. Slopes are 0 to 3 percent. Permeability and runoff is slow. A seasonal high water table is at a depth of 24 to 36 inches in winter and spring. The soil may be irrigated by sprinkler, furrow, or border irrigation; sprinkler irrigation is the most common and is very satisfactory. Irrigation water should be applied carefully at rates low enough to prevent runoff.

The next common soil mapping unit found within the project area is the Dayton-Amity-Concord soil association. These soils are somewhat poorly drained and poorly drained silt loams. These soils formed in mixed silty alluvium. Slopes are 0 to 3 percent and average about 2 percent. Permeability is moderately slow. Runoff is slow and a seasonal high water table is at a depth of 6 to 18 inches in winter and spring. The soil is irrigated mainly by sprinkler although furrow or border irrigation are also used. Irrigation water needs to be applied carefully at rates low enough to prevent runoff.

Other soil mapping units found within the project area consist of the Cove-Bashaw soils and Malabon-Coburg soils. The Cove-Bashaw soils are poorly drained silty clay loams on bottom lands, terraces, and fans. These soils formed in mixed clayey alluvium. Permeability is very slow and flooding is common.

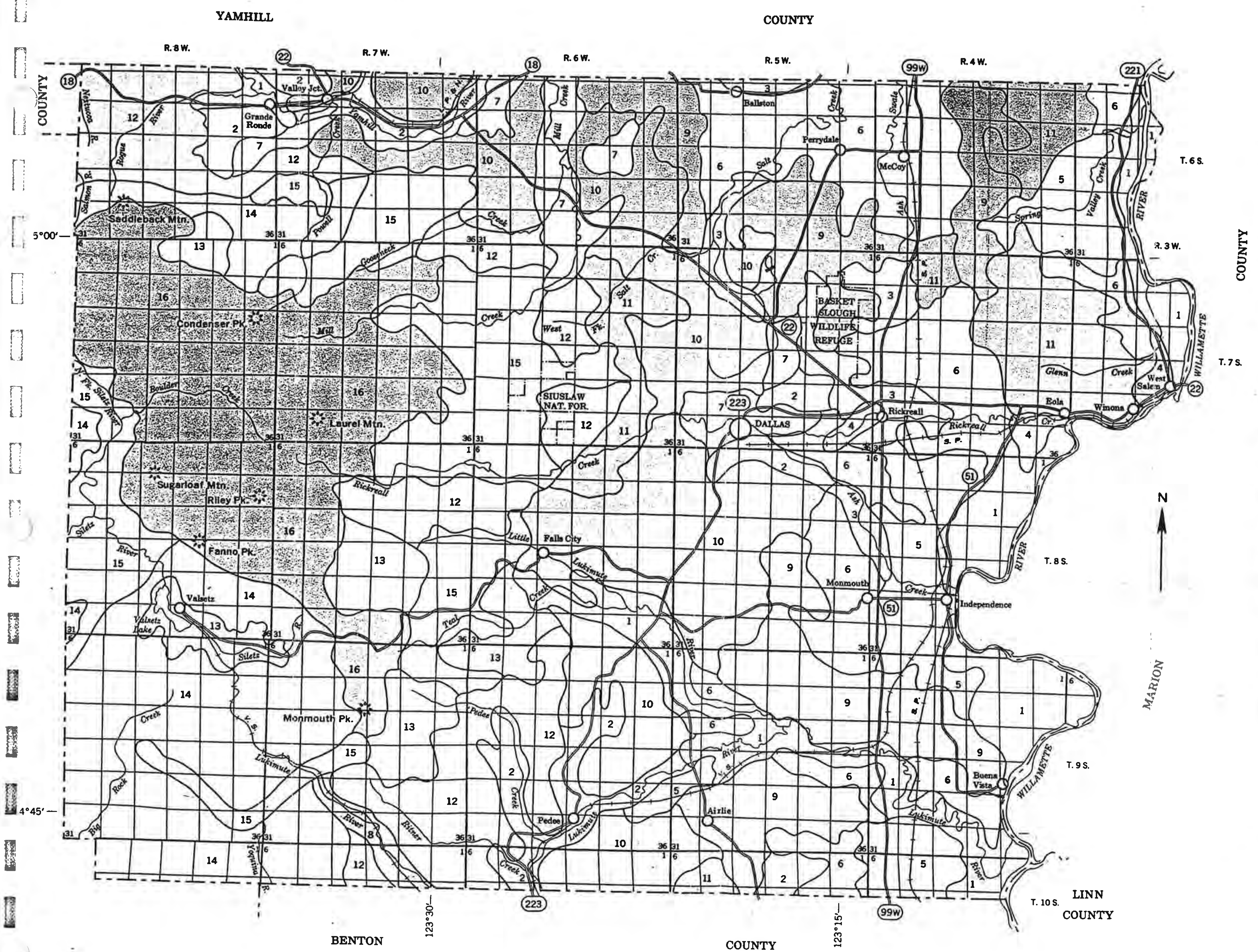
Malabon-Coburg soils consist of silty clay loams that formed in mixed alluvium on terraces along rivers and major streams. Slopes are 0 to 3 percent. These soils are subject to occasional flooding and typically have a seasonal high water table in winter and early spring.

Assessment of User Interest

CH2M HILL contacted the Polk County Soil Conservation Service to assess the potential irrigated land within the area and determine the level of interest. From previous work performed by SCS, the potential irrigated land was estimated to be around 4,000 acres. This estimate corresponds to our preliminary work on identifying potential lands for irrigation. Farmers currently receive irrigation water from Rickreall Creek or groundwater wells. There are a number of farmers within the area who do not irrigate because of a lack of water.

During the course of this project, CH2M HILL attended a meeting of the Polk Soil and Water Conservation District. The City of Dallas WWTF planning process and the potential option of providing treated effluent for irrigation was discussed. The District formed a committee to help assess the potential interest of the farmers in the area. This committee has continued to work on discussing the availability of this treated effluent with the various farmers near the WWTF.

Initial discussions have indicated that there is a significant interest in the availability of this water source. From these discussions and SCS survey information on available irrigated land, the study area apparently has sufficient capacity and interest to use reclaimed water from the WWTF.



Each area outlined on this map consists of more than one kind of soil. The map is thus meant for general planning rather than a basis for decisions on the use of specific tracts.

MAP UNIT

DOMINANTLY DEEP, SOMEWHAT EXCESSIVELY DRAINED TO POORLY DRAINED SOILS ON BOTTOM LANDS, TERRACES, AND FANS

1	Chehalis-Cloquato-Newberg: Well drained and somewhat excessively drained silty clay loams, silt loams, and sandy loams
2	Waldo-McAlpin: Poorly drained and moderately well drained silty clay loams
3	Cove-Bashaw: Poorly drained silty clay loams

DOMINANTLY DEEP, WELL DRAINED TO POORLY DRAINED SOILS ON TERRACES OF THE WILLAMETTE VALLEY

4	Malabon-Coburg: Well drained and moderately well drained silty clay loams
5	Dayton-Amity-Concord: Somewhat poorly drained and poorly drained silt loams
6	Woodburn-Willamette: Moderately well drained and well drained silt loams
7	Salkum-Briedwell: Well drained silty clay loams and silt loams

DOMINANTLY DEEP, POORLY DRAINED AND WELL DRAINED SOILS ON BOTTOM LANDS AND VALLEY TERRACES OF THE COAST RANGE

8	Brenner-Knappa: Poorly drained and well drained silt loams

DOMINANTLY SHALLOW TO DEEP, WELL DRAINED TO SOMEWHAT POORLY DRAINED SOILS ON FOOTHILLS AND UPLANDS

9	Helmick-Steiwer-Hazelair: Deep and moderately deep, well drained to somewhat poorly drained silt loams
10	Bellpine-Suver-Rickreall: Moderately deep, deep, and shallow, well drained to somewhat poorly drained silty clay loams
11	Jory-Nekia: Deep and moderately deep, well drained silty clay loams

DOMINANTLY DEEP AND MODERATELY DEEP, WELL DRAINED SOILS ON MOUNTAINOUS UPLANDS

12	Peavine-Honeygrove-McDuff: Deep and moderately deep, well drained silty clay loams
13	Blachly-Kilowan: Deep and moderately deep, well drained silty clay loams and gravelly silty clay loams
14	Bohannon-Astoria: Moderately deep and deep, well drained gravelly loams and silt loams
15	Kilchis-Klickitat: Shallow and deep, well drained stony loams and gravelly clay loams

DOMINANTLY MODERATELY DEEP AND SHALLOW, WELL DRAINED, COLD SOILS ON MOUNTAINOUS UPLANDS

16	Valsetz-Luckiamute: Moderately deep and shallow, well drained stony loams and very shaly loams

* Texture refers to the surface layer of the major soils unless otherwise noted.

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
OREGON AGRICULTURAL EXPERIMENT STATION

GENERAL SOIL MAP

POLK COUNTY, OREGON

SCALE 1:190,080

1 0 1 2 3 4 5 MILES

Compiled 1979

FIGURE 7-2
GENERAL SOILS MAP
FOR THE PROJECT AREA

CVO33407.B0

Proposed Land Application Sites

Potential irrigated areas for the alternatives are shown in Figure 7-3. No specific irrigation sites are identified for the alternatives; however, the area within the radius around the WWTF indicated in Figure 7-3 provides a general area that would provide the land area required. In general, qualifying application sites close to the plant would be the preferred sites to minimize conveyance and distribution requirements.

Implementation Issues

A number of issues related to implementation must be addressed during development of the land application system. These include the following:

- Ownership, operation, and maintenance of the site
- Phasing of site development

These issues are discussed in the following sections.

Future Ownership, Operation, and Maintenance

Land Ownership/Leasing. There are three land tenure options for the future land application site:

- Farmer ownership of property, written agreement with the City for dedication of land use to the land application system
- City lease of property, written agreement with the City for dedication of land use to the land application system
- City purchase of property

Site Operation and Maintenance. As with land ownership, there are alternative ways to operate and maintain the site:

- Farmer operates and maintains farming enterprise (replanting, fertilization, weed control, day-to-day irrigation, harvest and marketing of poplar trees); City monitors the system (soil, groundwater, and plant growth), recommends irrigation system operations, and funds initial establishment of trees and storage, distribution pipeline, and irrigation system.
- City operates and maintains entire site.
- City funds initial tree establishment, storage, distribution pipeline, and irrigation system; City contracts with company to manage as a utility.
- Privatization of poplar tree system; Company finances, designs, builds, and operates under a long-term agreement with an annual fee paid from the City.

Development Phases and Timing

The land application system could be developed in steps, gradually bringing more wastewater to the land application site and irrigating more land. Alternatively, it could be fully developed in a single construction phase.

Poplar Tree Reuse System Component Development. The poplar tree reuse system for any of the alternatives would include pump station(s), potentially a storage facility, distribution pipeline, irrigation system, and monitoring and control facilities, as well as planting and establishment of poplar trees. These items are discussed in further detail in the following sections.

Plantation and Surface Area. Poplar will be planted in lines 10 feet apart, separated by 2 feet along the lines, for a density of about 2,200 plants per acre. The densities described were included in a series of water balance analyses that indicate the appropriate size of the site.

Facility Description

Storage Facility. As indicated in the water balance analysis, the storage requirements for Alternatives 1 and 2 were 2,300 and 80 acre-feet, respectively. A field visit to the project area and review of maps helped determine the general location of the storage reservoir. Proximity to the WWTF is an important consideration at this level of analysis. Therefore, the land closest to the WWTF is considered as the primary location for any of the storage facilities required in the alternatives. This includes the storage required for the industrial flow. Additional work would be required to adequately determine the best available reservoir site. The land required for the storage would be 230 acres for Alternative 1 and 8 acres for Alternative 2. Because of the topography of the area, only embankment ponds were considered suitable for storage. Embankment ponds are typically constructed with small embankments or berms to completely enclose a relatively flat area. DEQ has indicated in previous projects, as well as this one, that a liner would likely be required for the storage reservoir to prevent groundwater contamination.

Transfer Pump(s) , Effluent Pump Station(s), and Filter Station(s). Alternative 1 requires a pump station and filter station near the storage facility. The pumps will provide capacity for the average daily flow with additional pumps to provide capacity for the peak daily flow. All pumps will be equipped with variable frequency drives that will allow the pumps to be operated over the full range of capacity. Alternative 2 requires a transfer pump station to transfer the industrial effluent to the storage facility. At the storage facility, a pump station and filter station will be required for both industrial and WWTF effluent flows.

The pumps at the storage facilities will pass through a filter station consisting of screen filters. As with the pumps, the filters will be staged in pairs to provide capacity for the average daily flow and peak daily flow, with one redundant filter. The filters will be equipped with self-cleaning, automatic suction scanners and 150-mesh filtration screens.

A chemical injection system will be installed downstream of the filter station to allow injection of supplemental fertilizer, pesticides, herbicides, chlorine, or acid as necessary. This system will include an injection pump and appropriate storage and mixing equipment.

Pipeline/Distribution/Application System. For each alternative, the pipeline system will consist of the mainline piping network and valve clusters that will control flow into separate 30-acre irrigation blocks. The PVC mainline pipe will provide capacity to distribute the peak daily flow to each of the valve clusters. For Alternative 2, a transfer pipeline will be required to convey the industrial flow to the storage facility.

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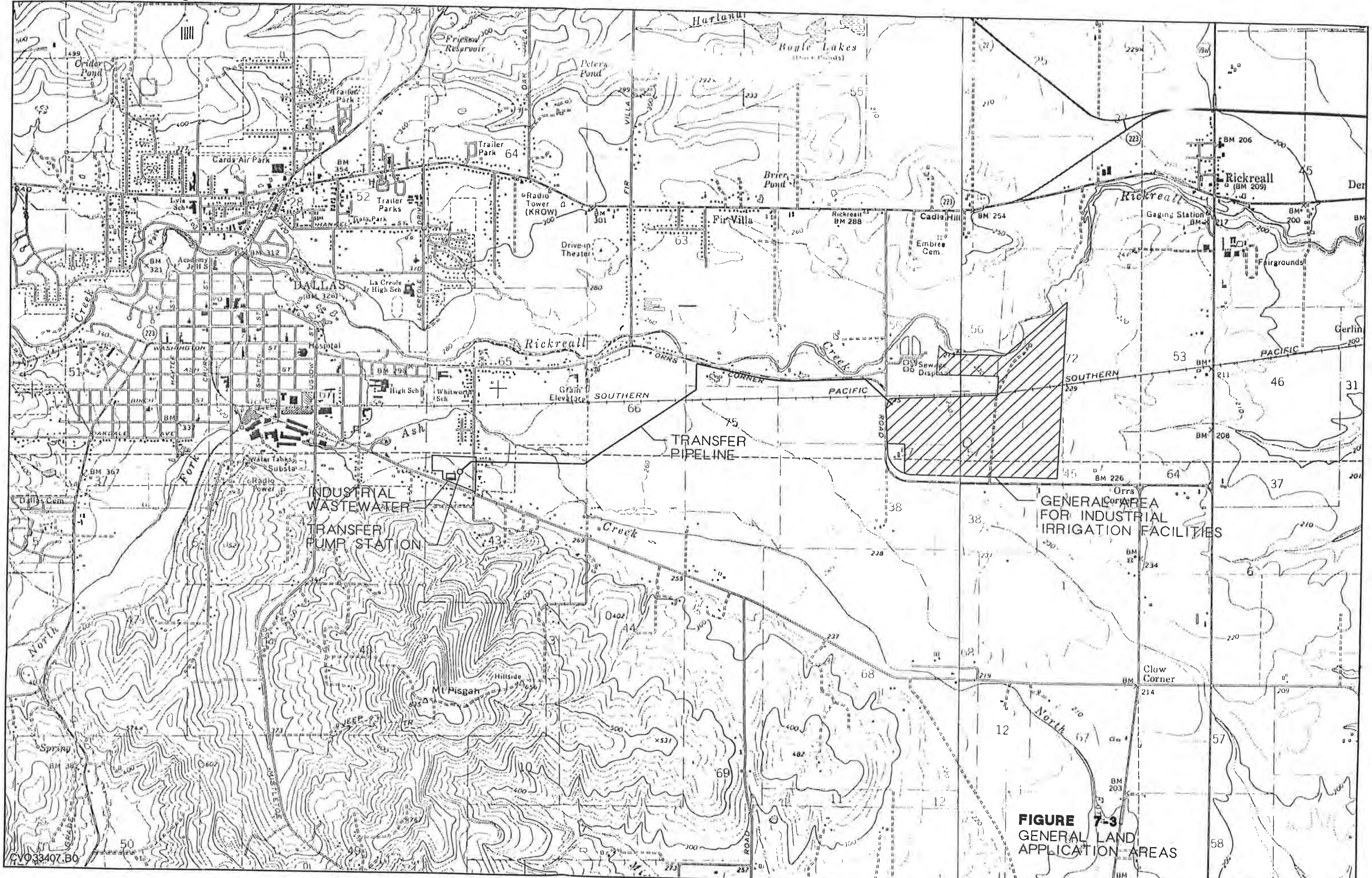

FIGURE 7-3
GENERAL LAND
APPLICATION AREAS

CH2M HILL

Each valve cluster will be centrally located to control operation of four adjacent irrigation blocks. Each manifold will be fabricated from galvanized steel and equipped with two electric control valves for each block being served by the manifold. The pair of control valves will allow the irrigation laterals in each block to be fed from both ends to improve hydraulic operation of the system. Each manifold will also be equipped with a flowmeter and pressure transducer for remote monitoring of system performance, and a manual valve that allows the cluster to be isolated from the mainline during maintenance.

The two automatic valves controlling each irrigation block will feed two buried submain pipes that will allow the irrigation laterals to be fed from both ends. This configuration will minimize the number of valve stations required and maximize the allowable length of each lateral. A flexible PVC riser tube will be used to connect the polyethylene tubing laterals with the buried submains.

The irrigation application system will feature small, low-pressure sprinklers with pressure compensating flow control nozzles that maintain a constant flow rate over a relatively wide pressure range. Flow is controlled by a flexible diaphragm in the nozzle that deflects under pressure and restricts the size of the flow passage. In addition to maintaining a uniform flow rate throughout the irrigation block, this flexing action offers the additional benefit of reduced nozzle plugging due to debris in the irrigation water.

The sprinklers and above-ground lateral tubing can be conveniently retrieved from the field prior to tree harvest. After harvest, the tubes and sprinklers can be returned to their original positions.

Monitoring and Control Description

Monitoring System. The poplar tree reuse system is essentially a soil moisture management system. Performance of this system is therefore based on measurements of irrigation and precipitation inputs to the soil, and of soil moisture levels throughout the tree root zone.

A central control system will be used to automate the collection and storage of monitoring data. Precipitation will be measured with an automated rainfall gauge installed onsite. Irrigation inputs will be recorded during operation by the central controller. Soil moisture will be measured with equipment based on time domain reflectometry (TDR), and possibly other methods as well.

The TDR monitoring system is based on a network of semipermanent probes installed in the soil throughout the site. The probes are 4 feet long, with five discrete sensing points located along the length of the probe. Probes are typically installed at two different depths to monitor soil moisture over a total depth of 8 feet.

A portable TDR sensor is used to acquire readings from each of these probes. Soil moisture readings are obtained by connecting the TDR sensor to each probe with a data cable. The sensor sends signals to the probe and the soil moisture levels at various soil depths are computed from the signals returning to the sensor.

The TDR monitoring system will include two TDR sensors and a network of TDR probes installed throughout the site. One sensor will be installed in the field and dedicated for continuous communication with the central controller. The other TDR sensor will be equipped with an internal datalogger and used to manually collect readings from the other probes. Custom software will be used to facilitate management of the manually collected data and to integrate the data with the primary operations database.

Central Control System. A central control system will be installed to control the operation of the irrigation and monitoring systems. This includes the following functions:

- Monitoring water levels in the storage/equalization tank
- Operation of the irrigation pumps
- Flow and pressure monitoring at the farm pump station
- Operation of the automatic filters
- Operation of filter flushing
- Operation of the filtrate grinders
- Flow and pressure monitoring at the farm filter station
- Operation of the chemical injection system
- Operation of irrigation supply valves at each distribution manifold
- Flow and pressure monitoring at the distribution system manifolds (valve clusters)
- Monitoring of TDR soil moisture measurements
- Remote communications

The central control system will be customized to simplify system operation and management of operations data. The system will also be equipped to allow remote monitoring and operation of all system components via telephone modem.

Conveyance, Distribution, and Outfalls

The conveyance, distribution, and outfall components of each system option are as described in the Preliminary Options Screening and/or Systems Options Development section of this chapter. Two conveyance options were identified for the Willamette River Discharge/Demand Irrigation option: the Highway 22 Route (Route 1a) and the Southern Pacific Railroad Route (Route 1b). Preliminary capital cost estimates for Routes 1a and 1b were $7.0 million and $5.3 million, respectively, in 1995 dollars. Route 1a is therefore not considered further.

Outfall Route 1b will be approximately 8 miles in length. The pipe diameter will be 24 inches. Pipe materials to be considered during the predesign include cement-lined ductile iron and high density polyethylene (HDPE). Measures to reduce hydrogen sulfide formation potential in the outfall will be included in the design of the new outfall force main. The high chlorine dose provided for this option will significantly reduce this formation potential. Further options may be evaluated during predesign to determine the best control measure to prevent hydrogen sulfide formation in the outfall force main, including effluent aeration at the effluent pump station and air stripping at the outfall structure.

Cost Evaluation

Capital and operation and maintenance costs are developed in this section to allow comparison of the system options. The costs are order-of-magnitude estimates developed using EPA cost curves and CH2M HILL past project cost data, and are not based on detailed engineering design. The estimated accuracy is between -30 and +50 percent. Final project costs will depend on a variety of factors such as the final scope, bid-time market conditions, and implementation schedule.

Capital Cost Basis

Capital costs shown here are based on the design flows, sizing, and design assumptions and information in Appendix C.

Operation and Maintenance Cost Basis

The following unit costs and assumptions were used to develop the O&M cost estimates:

Labor	Basic 1995 annual salaries of $40,000 for a superintendent; $35,000 for an Operator 4; $31,600 for an Operator 3; $30,000 for an Operator 2; $26,600 for an Operator 1; $30,000 for a maintenance person; and $25,000 for a laboratory technician. The superintendent's time is shared, 60 percent for liquids and 40 percent for solids. A factor of 1.5 is applied to all basic salaries to account for benefits. Sufficient personnel with appropriate operator classification/training are assigned as required by the complexity of each option.
Power	1995 rate of $0.05 kWh. Rated equipment horsepower was averaged over the year 2010 to obtain power consumption under average annual flow/loading conditions at the approximate midpoint of the design period.
Chemicals	Present unit costs at the year 2010 average annual consumption.
Maintenance	1 percent of the treatment capital cost in 1995 dollars.

O&M costs over the 25-year period (1995-2020) are converted to 1995 dollars by applying a present worth factor at an inflation adjusted interest rate of 8.875 percent per year, compounded annually.

Cost Comparisons

Listings of capital, O&M, present worth, salvage, and total net present worth costs for the four system options are provided in Tables 7-9 through 7-11. For calculation of salvage values, it was assumed that equipment has no value in the year 2020, that buildings, basins, and yard piping have half their 1995 value in 2020, and that land values remain constant (after adjusting for inflation) throughout the planning period.

Noncost Evaluation Criteria

The criteria used for evaluating the system options on a noncost basis are grouped into two broad categories: technical feasibility criteria and environmental impact criteria. The technical feasibility criteria are:

Table 7-9
Dallas Wastewater Treatment Facility Plan
Liquid Treatment and Disposal Alternatives
Relative Capital Cost Estimates

System Component	Capital Cost Estimates (1995 $, Millions)			
	1	2	3	4
	No Discharge Winter Storage & Summer Irrigation	Rickreall Discharge & Summer Irrigation	Willamette Discharge & Demand Irrigation	Year Round Rickreall Discharge
Liquid Treatment				
Operations and Control Building	0.6	0.6	0.6	0.6
Influent Pumping	1.6	1.6	1.6	1.6
Headworks	0.6	0.6	0.6	0.6
Aeration	2.8	3.8	2.8	4.7
Secondary Clarification	2.6	2.9	2.9	2.9
Filtration	0.0	1.5	1.5	2.6
Tertiary Clarification	0.0	0.0	0.0	3.2
Microfiltration/Reverse Osmosis	0.0	0.0	0.0	14.0
Chillers	0.0	0.0	0.0	0.5
Disinfection/Dechlorination	0.7	1.0	0.7	1.0
Reaeration	0.0	0.4	0.0	0.4
Intermediate Pumping	0.5	0.0	0.0	0.0
Treatment Subtotal	**9.4**	**12.4**	**10.7**	**32.1**
Liquid Disposal				
WWTF Effluent Storage	16.2	0.0	0.0	1.8
WWTF Effluent Pumping	0.7	0.2	0.7	0.0
WWTF Pipeline/Distribution	10.8	3.5	5.3	0.0
WWTF Irrigation Site Land	2.3	0.6	0.0	0.0
Industry Effluent Storage	0.0	1.5	0.0	0.0
Industry Effluent Pumping	0.0	0.1	0.0	0.0
Industry Pipeline/Distribution	0.0	1.1	0.0	0.0
Industry Irrigation Site Land	0.0	0.2	0.0	0.0
Outfall	0.0	0.2	0.4	0.2
Outfall Land	0.0	0.0	0.5	0.0
Disposal Subtotal	**30.0**	**7.4**	**6.9**	**2.0**
Treatment and Disposal Total	**39.4**	**19.8**	**17.6**	**34.1**

Table 7-10 Dallas Wastewater Treatment Facility Plan Liquid Treatment and Disposal Alternatives Relative O&M Cost Estimates				
	System O&M Cost Estimates (1995 $, Millions)			
	1	2	3	4
Cost Category	**No Discharge Winter Storage & Summer Irrigation**	**Rickreall Creek Discharge & Summer Irrigation**	**Willamette River Discharge & Demand Irrigation**	**Year-Round Rickreall Creek Discharge**
Labor	0.20	0.19	0.17	0.57
Power	0.12	0.12	0.08	0.84
Chemicals	0.05	0.14	0.15	0.38
Maintenance	0.20	0.17	0.16	0.54
Total O&M Costs	**0.57**	**0.62**	**0.56**	**2.33**

Table 7-11 Dallas Wastewater Treatment Facility Plan Liquid Treatment and Disposal Alternatives Relative Present Worth Cost Estimates				
	Present Worth Cost Estimates (1995 $, Millions)			
	1	2	3	4
Cost Category	**No Discharge Winter Storage & Summer Irrigation**	**Rickreall Creek Discharge & Summer Irrigation**	**Willamette River Discharge & Demand Irrigation**	**Year-Round Rickreall Creek Discharge**
Capital Cost	39.4	19.8	17.6	34.1
Present Worth of O&M Cost	5.7	6.2	5.6	23.1
Present Worth Costs	45.1	26.0	23.2	57.2
Present Worth of Salvage Value	4.4	1.6	1.2	1.4
Present Worth Poplar Revenue	3.4	1.2	0.0	0.0
Total Net Present Worth Cost	**37.3**	**23.2**	**22.0**	**55.8**

- Ease of implementation
- O&M characteristics
- Performance reliability
- Flexibility
- Energy use and resource recovery
- Future regulatory compliance

The environmental impact criteria are:

- Land use compatibility
- Zoning/permitting
- Recreational impacts
- Water resources
- Socioeconomic impacts
- Natural habitat
- Wetlands
- Floodplains
- Cultural and historical resources
- Visual, noise, and odor impacts

A discussion of the noncost evaluation criteria follows.

Ease of Implementation

Implementation capability depends on factors such as ability to obtain required permits, ability to obtain adequate land, legal constraints, staffing, and institutional and financial constraints. The difficulty of combining new facilities with existing ones and any process and operational compromises associated with upgrading the existing facility are also implementation factors.

O&M Characteristics

O&M characteristics affect the ability of the plant staff to operate the proposed facility to meet the treatment and effluent requirements. Factors associated with operability include the number of staff and level of staff experience required to operate the facility.

Performance Reliability

Performance reliability is the ability to consistently meet the effluent requirements, and is generally higher for new facilities than for retrofits. Existing facilities present a higher potential for operational problems.

Flexibility

Flexibility is the ability to respond or adapt to future growth, regulatory requirement changes, and new technologies. Flexibility also deals with the ability to use various modes of operating the facility in order to optimize treatment.

Energy Use and Resource Recovery

Energy use and resource recovery refers to minimization of energy consumption and beneficial use of the treatment system byproducts.

Future Regulatory Compliance

The flexibility of an option is related to its ability to meet future regulatory requirements. An option that can be implemented with space to spare for future expansion has an advantage.

Land Use Compatibility

Construction and/or operation of the facilities could conflict with existing or planned development. Options requiring developed land or land in developed areas could also increase development costs and result in disruption of uses. Options with fewer potential impacts to existing or planned development are preferred.

A review of aerial photographs and maps, and field visits provided data for evaluating land use compatibility.

Because of the large number of acres that could eventually be required for some of the options, it is assumed that more than one owner and one block of land would be required to implement the selected program. Fewer ownerships would ease acquisition, leasing, and management difficulties. Consequently, combined areas with blocks containing large tracts of land under a limited number of ownerships are preferred.

Ownership estimates were obtained by combining information from tax lot maps and aerial photographs of the project area. It was assumed that a general correlation exists between farm tract size, tax lot size, and number of ownerships.

Zoning and Permitting Requirements

Land use zone designations and the manner in which uses are permitted in each zone indicate the general compatibility of proposed facilities with existing and planned uses.

Within Polk County, options requiring existing public rights-of-way that do not include any floodplain or significant resource areas would not require local land use permitting review. Conditional use permits (CUP) from the county would be required for WWTF facilities located on private land. Options that use properties zoned for Exclusive Farm Use (EFU), Farm Forest (FF), or Timber Conservation (TF), are preferred because these properties generally contain limited development. Options that would require rural residential, commercial, industrial, floodplain, or significant resource zoned properties are less desirable because the facilities would be less compatible with existing or planned uses.

Within the City of Dallas, options requiring existing public rights-of-way that do not include any special use overlays are preferred.

Review of comprehensive plan and zoning maps, and consultations with City of Dallas and Polk County planning staff provided information for evaluating this criterion.

Recreational Impacts

Recreational activities may be sensitive to nearby wastewater treatment facilities. Activities involving water contact may be particularly sensitive to nearby outfall locations. Rural recreational facilities in or near the project area include:

- Salem Yacht Club Marina, located on the northwest bank of the Willamette River near river mile 88.5
- Wallace Marine Park, located on the northwest bank of the Willamette River near river mile 85.3
- Holman Wayside, located on the north side of Highway 22 at its intersection with Doaks Ferry Road (no river access)
- Mintow-Brown Island Marion County Park, located on the east bank of the Willamette River downstream from the project area between river miles 85.3 and 86.5
- Baskett Slough National Wildlife Refuge, located north of Highway 22 between Dallas and Rickreall-includes trails and other opportunities for dispersed recreation (such as hunting and sightseeing)
- Coast Range Mountain Trails, located east of Aaron Mercer Reservoir
- Polk County Fairgrounds, located in Rickreall
- Nesmith County Park, located near the Polk County Fairgrounds
- Social Security Fishing Hole Greenway Park, located at the end of Halls Ferry Road.

Generally, options located further away from recreational use areas are preferred.

Review of topographic and planning maps, and consultation with City of Dallas, Polk County, and Marion County planning staff provided information for evaluating this criterion.

Water Resources

Rickreall Creek provides water for approximately 1,163 irrigated acres, obtained through 86 certificated water rights with points of diversion downstream from the current outfall. A majority (77 percent) of the certificated rights are used for properties under 20 acres, which is the minimum parcel size permitted by Polk County for proposed commercial farm enterprises. These water rights account for only 22 percent of the water appropriated. About 5 percent of the certificated rights apply to 23 percent of the irrigated land composed of 100-acre parcels or larger. Water rights for agricultural uses generally apply to diversions between May and September, with the bulk of the withdrawals occurring during July and August.

All of the priority dates for the downstream rights post-date all but 0.06 cfs of the City's stream water rights. A state in-stream water right has a priority date of June 22, 1964, which post-dates the City's stream water rights. Downstream rights with earlier priority than the City's would require that water be allowed to pass the City's water intake if it is naturally in the stream (that is, not part of releases from reservoir storage). Senate Bill 204 (passed by the

Oregon Legislature) indicates that waters removed from streams for municipal purposes can be used and disposed of at the discretion of the municipality.

Options that would minimize impacts to existing water rights are preferred because of related socioeconomic impacts. Distinction must be made, however, between the legal seniority of certificated water rights and socioeconomic impact of changes in water use patterns.

Computerized data output from the Oregon Water Resources Department obtained in 1994 provided information for evaluating this criterion.

Socioeconomics

Socioeconomic issues related to the facilities plan are expected to focus on potential impacts to sewage rates to those people served by the Dallas WWTF, and to indirect impacts to the farming community resulting from liquid treatment options that might reduce in-stream water levels during the irrigation season and thereby adversely affect farming activities/crop values. In many situations, these publics are competing water users. An option that minimizes the impacts to these two publics would be preferable.

Natural Habitat

Wildlife habitats vary substantially throughout the study area. Riparian areas might provide suitable habitat for many species. Polk County has designated all Class 1 streams and their riparian areas as Statewide Planning Goal 5 properties and have applied the Significant Resource Areas overlay zone to these lands. This includes Rickreall Creek, Ash Creek, and the Willamette River. The Oregon Department of Fish and Wildlife also imposes in-water work restrictions on streams to protect aquatic resources, water quality, and other beneficial uses. The in-water work window for Rickreall Creek is July 1 through October 1. Numerous species of fish have been observed at various locations in Rickreall Creek, including salmonids (e.g., steelhead, cutthroat and rainbow trout). However, that portion of Rickreall Creek below the existing Dallas WWTF outfall has been designated and is managed by the ODFW as a salmonid passage rather than a salmonid spawning/rearing stream. Reaches upstream of the outfall are designated and managed as possible salmonid spawning/rearing habitat. Options that would minimize impacts to fish (especially salmonid passage downstream from the outfall) and other aquatic species would be preferable. There may be some flexibility in these construction windows. Options that minimize impacts to important fish and wildlife habitats are preferred.

Several sensitive species or their habitats have been observed in the project vicinity. Habitats may occur in the vicinity for the following species (this is only a partial list): mountain quail (*Oreotryx picta*); red-legged frog (*Rana aurora*); tailed frog (*Ascaphus truei*); northwestern pond turtle (*Clemmys marmorata marmorata*); painted turtle (*Chrysemys picta*); Oregon giant earthworm (*Megascolides macelfreshi*); valley silverspot butterfly (*Speyeria zerene bremneri*); Olympic salamander (*Rhyacotriton olympicus*); grasshopper sparrow (*Ammodramus savannarum*); coho salmon (*Oncorhynchus kisutch*); lupine (*Lupinus sulphureus* var. *kincaidii*); tall bugbane (*Cimicifuga elata*); dotted water-meal (*Wolffia punctata*); Columbia water-meal (*Wolffia columbiana*); Curtus' aster (*Aster curtus*); lesser bladderwort (*Utricularia minor*); and humped bladderwort (*Utricularia gibba*).

Options that would require properties containing habitat for rare or endangered species involve substantial project delays because of required surveys, negative environmental findings, and mitigation measures. In extreme cases, such options may have to be abandoned.

Data were obtained from aerial photographs, field visits to potential sites/areas, ODFW, and review of the Oregon Natural Heritage Database. During 1994, a reconnaissance survey was conducted to assess current vegetation and identify actual or potential habitat for the Oregon giant earthworm and the northern red-legged frog (Budhabhatti J., and M. Gallagher, 1994). During the Spring of 1995, a field reconnaissance survey was conducted of Rickreall Creek and the general vicinity of the proposed lagoon sites, lagoon/irrigation mainline pipeline routes, and irrigation fields to identify the presence of sensitive plant species. A concurrent reconnaissance was conducted of the creek to identify the presence of sensitive animals and/or animal habitats, focusing on areas along Rickreall Creek. A reconnaissance survey of Rickreall Creek was conducted during the low flow period in October 1995, to provide baseline data for aquatic resources. No investigation is thorough enough to exclude the presence or use of the project area by sensitive wildlife or fish. If sensitive species were not observed during the assessment, such a finding should not be construed as a guarantee of the absence of such species.

Wetlands

Seasonally flooded palustrine wetlands are the predominant type of mapped wetland in the project area. Linear wetlands are located along the major creeks in the area. Large blocks of agricultural land do not contain mapped wetlands; however, large areas of these blocks of agricultural land are comprised of hydric soils that may indicate the presence of wet conditions.

Wetlands within possible facility sites are not desirable. Surveys and permitting requirements for identifying, delineating, and analyzing wetlands and addressing possible impacts could result in delays and potentially complex agency negotiations. Current wetland delineation methods would be used to identify wetlands that fall within the jurisdiction of the Clean Water Act. Wetland mitigation requirements could have substantial secondary land impacts.

Displacing soil in jurisdictional wetlands would require U.S. Army Corps of Engineers (USCOE) and Oregon Division of State Lands (DSL) Section 404 removal/fill permits.

Data were obtained from review of National Wetlands Inventory maps, and SCS soil survey maps that indicate the presence of hydric soils and possible wetland areas. Two field reconnaissances (Mader 1994; Girts et. al. 1995) were conducted to identify wetlands that might be affected by the proposed expansion project alternatives. The first reconnaissance focused on the Willamette discharge alternative and the possible impacts to wetlands that might occur from WWTF expansion and pipeline construction and operation. The second reconnaissance focused on identifying possible wetlands that might experience changes in their biological functions as a result of stream flow reduction in Rickreall Creek under the various alternatives. Both investigations focused on identifying the general location of wetlands, and did not include formal wetland delineations. A copy of each of the technical memorandums discussing the wetlands reconnaissances conducted for the project are on file at the Dallas Public Works Department.

Floodplains

Floodplains located within or around a potential site could reduce its implementability because of potential inaccessibility or damage during flood events. Facilities located out of the floodway and 100-year floodplain are preferred.

Information concerning locations of floodplains was obtained from Federal Emergency Management Agency (FEMA) National Flood Insurance Program Flood Insurance Rate Maps (FIRM) of the study area.

Cultural and Historical Resources

Types of cultural resources that could be affected include sites listed on the National Register of Historic Sites and Places, the Statewide Inventory of Historic Places, the Polk County Goal 5 Inventory, and areas of archaeological importance. Such sites should be avoided whenever possible.

Few archaeological sites are recorded in the project area. Little of the area has been surveyed for archaeological resources. Most recorded sites occur near streams. An historical resource survey has been conducted for Polk County, and several historic structures have been identified in the project area. Located north of the WWTF, the site of the Jefferson Institute is the nearest known Goal 5 cultural resource. Because of its proximity to the plant, this site has the most potential to be affected by all the proposed projects.

Cultural resource surveys would probably have to be conducted for proposed development sites.

Data were obtained by contacting the State Historic Preservation Office (SHPO), the Polk County Community Development Department, and through windshield field observations.

Visual, Noise, and Odor Impacts

Construction and operation of WWTF facilities could affect the implementability of an option by raising public concern about its visual, noise, and odor impacts. Visual impacts could include construction activity and dust clouds, and long-term modifications to the viewshed by introduction of new facilities. Noise impacts could result from construction activities and facility operations. Odor impacts could result primarily from facility operations, including lagoon operations and effluent irrigation. These concerns might be raised during the public review of the WWTF Facility Plan or any of the permits required for construction of new facilities. Sites that minimize impacts to sensitive viewsheds and to noise- and odor-sensitive locations are preferred.

Noncost Evaluation of System Options

The system options are evaluated separately with respect to the technical feasibility criteria and the environmental impact criteria. This section first compares the options by the technical feasibility criteria, followed by a discussion of the environmental impacts of each option.

Environmental impacts of each system option can be categorized as those resulting from expansion and retrofit activity at the existing plant site, and those resulting from offsite construction of storage, conveyance, distribution, and/or outfall facilities. Since impacts of plant expansion are localized and similar in nature for all system options, these are discussed generically. The degree of positive or negative plant expansion impact of each option is then determined in proportion to the degree of expansion activity associated with it. However, offsite impacts are discussed separately for each option because of their wide variability and geographical spread.

The noncost evaluation of system options is organized as follows:

- Technical feasibility evaluation
- Onsite plant expansion impacts
- Winter storage with summer irrigation offsite impacts
- Rickreall Creek with summer irrigation offsite impacts
- Willamette River discharge/demand-based irrigation offsite impacts
- Year-round Rickreall Creek discharge offsite impacts

Technical Feasibility Evaluation

The Willamette River discharge option is the easiest to implement with respect to staffing and legal constraints, but the most difficult with respect to land acquisition. Land acquisition for the poplar irrigation options is less complicated and is comparable for the two options, and is simplest for the year-round Rickreall Creek discharge option. The Willamette River discharge option also scores high on O&M characteristics because of treatment simplicity, modest effluent quality requirements, minimal staffing, and absence of irrigation management demands. The year-round Rickreall Creek discharge option is operationally the most complex.

Both the no discharge and Willamette River discharge options are expected to provide highly reliable performance with simple, proven treatment processes. The advanced biological and physio-chemical treatment technologies required for the two Rickreall Creek discharge options involve a larger number of design and operational variables that can compromise reliability.

The Willamette River discharge option provides a great deal of flexibility by providing the option to irrigate and by saving more space for future expansion. The no discharge and year-round Rickreall Creek discharge options have virtually no flexibility because they must store/irrigate and maintain, respectively, the high effluent quality at all times.

The two poplar irrigation options provide the maximum resource recovery to energy use ratio. The Willamette River discharge/demand irrigation option has the potential to provide significant resource recovery. By augmenting Rickreall Creek flow during dry weather periods and thus making the effluent available for irrigation, creek discharge also provides substantial resource recovery.

Options involving a significant irrigation component have an advantage over those having a significant stream discharge component because discharge regulations are more likely to become more stringent in the future compared to irrigation reuse regulations. In addition, year-round Rickreall Creek discharge has a particular disadvantage with respect to current 40 CFR, Part 503 regulations concerning beneficial reuse of biosolids. The contaminants and metals removed from the liquid stream by the advanced processes are eventually incorporated in the biological solids and chemical sludge. There is thus a large increase in both the solids quantity and metals content. In particular, the solid's copper content is currently at or near the specified limit for beneficial reuse. Advanced treatment may eliminate beneficial reuse of plant solids production. Although it is desirable to have the option of landfill disposal, year-round Rickreall Creek discharge eliminates other options, which is a major disadvantage.

Onsite Plant Expansion Impacts

Impacts of expansion and development at the existing plant site are described in this section. The degree of positive or negative impact associated with each system option varies according to the degree of expansion required for that option. All plant expansions are expected to occur on the existing plant property under all options except the continuous Rickreall Creek discharge option. The additional potential impacts resulting from plant expansion under this latter option are discussed under the separate heading for that option.

Land Use Compatibility

The property on which the WWTF is located is owned by the City of Dallas. The property contains the WWTF, a dog pound, a police firing range, and some vacant land.

Farmland dominates the land use pattern in the vicinity of the WWTF. A private dwelling is located on the northeast corner of the intersection of Bowersville Road and the plant driveway, west of and adjacent to the plant. A house is located about 400 feet west and 200 feet northwest of the plant at the intersection of Bowersville Road and Orrs Corner Road. Another residence is located just north of the Bowersville Road bridge over Rickreall Creek.

Plant expansion would require conversion of the vacant land on the City's property. The dog pound and police firing range may also be displaced if the selected treatment option requires additional land for plant modifications. Alternative locations for the potentially displaced facilities have not been identified.

Local Land Use Zoning and Permitting Requirements

Polk County has zoned the property on which the WWTF is located as Public Services. Expansion of the WWTF would be a permitted use in this zone. A conditional use permit may be required by Polk County if significant resource areas are affected adjacent to Rickreall Creek (i.e., riparian areas). Additionally, a floodplain development permit may be required if facilities are proposed in the floodplain.

Recreational Impacts

Expansion of the WWTF is not expected to result in substantial adverse impacts to recreational activities. The property is not used for recreational purposes. Although Rickreall Creek may be used for recreational activities such as fishing, no substantial adverse effect is expected.

Natural Habitats

Field investigations on the property indicate that, while it contains possible habitat for the Oregon giant earthworm and the northern red-legged frog, no identifiable specimens of either species were found. Most of the property's habitat value has been substantially altered by construction and use of the WWTF, dog pound, and police firing range. The remaining riparian habitat, although affected by noise impacts from plant operations, does provide habitat for several species. In addition, Rickreall Creek contains habitat for coho salmon.

Wetlands

A reconnaissance of the WWTF plant property was conducted to identify jurisdictional wetlands and waterways (Mader, 1994). The property contains the riverine, lower perennial, unconsolidated bottom, permanently flooded wetland that comprises the Rickreall Creek channel, and the three palustrine aquatic bed, artificially flooded, excavated wetlands that comprise some of the treatment ponds on the site. The vacant portion of the site contains hydric soils that may indicate wetland conditions in the expansion area.

Expansion and integrated operation of the WWTF plant is expected to require filling a possible jurisdictional wetland adjacent to the existing treatment plant. Because the wetland fill is required to provide for the expansion and integrated operation of all facilities, the probability of successful negotiation of the permit process with the USCOE and DSL is increased. Based on the evaluation conducted in conjunction with the aforementioned reconnaissance, it appears that a project purpose and need statement can be prepared to comply with Section 404(b)(1) of the Clean Water Act guidelines to demonstrate that practicable alternatives to wetland filling do not exist. Considering the benefits to the public and local economy, the feasibility of wetland fill for the expansion has a high probability of success.

A wetland survey should be conducted at the Environmental Assessment or predesign stage to delineate wetlands in the expansion area and to determine the extent of mitigation wetlands that might be required.

Floodplains

The northern and eastern portions of the property nearest Rickreall Creek lie within a Zone A floodplain. Flood elevations are not expected to be significantly impacted at any one point.

Cultural and Historical Resources

The property does not contain recorded cultural resources. The property is located near Rickreall Creek and at the interface of the floodplain and uplands. These areas typically have a higher probability of containing prehistoric sites than areas more distant from major streams. A cultural resource survey should be conducted at the predesign stage to identify any possible archaeological resources on the property.

Visual, Noise, and Odor Impacts

Plant expansion construction activities may cause temporary adverse affects to views from the two residences west of the property. Temporary and adverse noise impacts to these properties, as well as to the residence northwest of the plant site, may also result from construction activities.

System Option 1

Storage ponds for this option (winter storage with summer irrigation) would require approximately 500 acres. Emergency discharge requirements will require that the ponds be located close to the existing WWTF site and Rickreall Creek, which would provide an emergency discharge destination. An estimated 900 acres would be required for effluent irrigation of agricultural lands for poplar tree crops under the agronomic rate and land treatment scenarios. The effluent pipeline system would be expected to use existing rural rights-of-way to the maximum extent possible, although it is assumed that a small amount of private land may be required to fully distribute the wastewater effluent.

Land Use Compatibility

Lands south, north, and east of the existing WWTF are characterized by farm-related development with dispersed residences generally located along existing roadways or located at the end of long private driveways. Large tracts of farmland are located on the Baskett Slough National Wildlife Refuge to the northeast of the plant site. Several residences, located on the northern and eastern slopes of Mt. Pisgah, overlook the agricultural fields south of the plant site.

Because irrigated properties would continue to be used to grow crops, adverse short-term or long-term effects on the overall land use pattern of the project area would not be expected to be substantial and are expected to be localized to those agricultural fields adjacent to or within the near vicinity of the existing treatment plant site.

Construction of the effluent pipeline system along existing roadways would probably temporarily affect access to a few residences, most of which would be farm-related dwellings. Access limitations would be expected to last only for a day or two at any access point. Consequently, impacts to any single residence or to any group of residences are expected to be minimal.

Construction of the pipelines and/or storage ponds may affect agricultural irrigation and/or underground drainage tiling systems that facilitate farming activities permitted on agricultural properties. The likely locations of the pipelines along roadways and adjacent to or through fields that would be used for effluent irrigation would minimize this potential effect to nonproject related agricultural properties. Disturbance to the nonproject related agricultural irrigation and/or drainage systems could reduce agricultural productivity on the serviced properties. If the City cannot reestablish the lines to allow equivalent use on the affected property, damage payments to those owning the affected property would be needed to compensate for the loss in value to the serviced property. Although unlikely to occur, any displacement of such irrigation or drainage facilities would not be expected to preclude agricultural use of the properties; however, the long-term economic productivity of the properties may be adversely affected. Given that most farming operations in the vicinity of the treatment plant that might be partially dependent upon such systems are focused on grass seed crops with grain rotations, it is not expected that an unlikely change from irrigated to nonirrigated or drained to nondrained operations would require substantial machinery expenditures by the farm operators.

Storage ponds would probably require long-term conversion of approximately 500 acres of agricultural land. Several additional acres would be required for containment structures and ancillary facilities. Existing houses and ancillary structures within this area are not expected to be displaced by construction and/or operation of the storage ponds. Access to other farm properties potentially used by operators located on these properties would not be adversely affected. Aesthetic impacts to the residences are discussed under "Visual, Noise, and Odor

Impacts" below. Other future uses of the property(ies), such as farm-related residential uses, would be precluded.

Most of the converted land would probably be prime agricultural property, or farmland of statewide importance. If federal funds are used for the project, a Farmland Conversion Impact Rating Form will need to be submitted to the SCS for their review with respect to the Farmland Protection Act.

Agricultural fields currently used primarily for grass seed, grain, or hay crops would be converted to tree crops. Tree crops are considered an agricultural/forestry use. Consequently, the conversion would trigger a small change in regional agricultural economic productivity of foodstuffs to an agricultural/forest economic productivity of wood fiber. Such a conversion could beneficially diversify local agricultural/forest economic sectors.

Solar access for crops on adjacent properties, and vehicular access to area farm fields would not be adversely affected given that adequate buffer area would be provided between project sites and adjacent fields. Consequently, long-term agricultural activities on adjacent, nearby, or regional properties would not be affected by tree farming.

By potentially reducing the amount of water available to downstream irrigators, some farming enterprises in the project vicinity may experience indirect impacts to the productivity potential of their properties. Such impacts are not expected to significantly alter overall dominance of agricultural land use patterns in the project area. This is further discussed under "Socioeconomic Impacts" and "Water Resources" below.

Indirectly, the visual and perceived odor long-term effects of storage ponds might make portions of adjacent properties less suitable for some permitted uses, such as farm-related residences. However, adequate distance buffers between ponds and adjacent properties would minimize these impacts.

Constraints associated with the topographic relief of the fields north of the existing plant site, roadway networks in the area within 1.0 miles of the plant site, and/or numerous ownerships severely limit potential locations for a large storage pond. However, construction of deeper ponds requiring less surface area, or a series of smaller ponds may be feasible.

Zoning and Permitting Requirements

All development required for this option would occur within Polk County's land use jurisdiction. It is assumed that all of the development associated with pipelines, storage ponds, and effluent irrigation onto tree farms would occur on lands zoned Exclusive Farm Use (EFU). The following Polk County land use permitting requirements would apply to this option:

- Conditional Use Permit (CUP)
  - Storage pond(s) (excavation/grading and disposal of excess excavated materials may require additional permits; it is assumed that disposal sites for excess excavated materials would not include wetlands or floodplains)
  - Pipeline segments extending from existing rights-of-way and serving more than one farm operation

- No Permits/Review
  - Segments of the effluent pipeline system using existing rights-of-way. This would require a Road Rights-of-Way permit from the Polk County Department of Public Works
  - Irrigation facilities such as sprinkler irrigation systems for single farm operations
  - A pipeline crossing another farm operator's property (would require a private easement)

Recreational Impacts

Short-term and/or long-term impacts to recreational activities are not expected to be substantial. Recreational activities occurring near or downwind from the prevailing wind direction could be adversely affected by effluent storage ponds. However, no public recreational facilities are located within a 1-mile radius of the WWTF.

Removal of water from Rickreall Creek would reduce the amount of water in the stream available for aquatic species. This could result in some reductions in the area and quality of aquatic species habitats along Rickreall Creek, especially during summer months (see "Natural Habitat" discussion below). Reduction of fish habitat could adversely affect current and/or future recreational fishing opportunities along the creek.

Irrigating with effluent is not expected to adversely affect recreational land uses.

Long-term effects to recreational activities may occur. Effluent irrigation would remove effluent from area streams and would minimally benefit recreational activities involving water contact downstream in the Willamette River. These activities could include swimming, water skiing, and jet skiing activities oriented around or from the Salem Yacht Club Marina, Wallace Marine Park, or Mintow-Brown Island Marion County Park.

Water Resources

A complete study of this option's effects on appropriation of waters from Rickreall Creek has not been conducted. Displacement of between 3.8 and 5.4 cfs of effluent discharge from the flow of Rickreall Creek on an annual average basis could affect water uses dependent on the stream downstream from the WWTF.

Two issues pertaining to water rights have been a common concern for farmers and water users in general. First, the removal of discharges to Rickreall Creek will have an effect on in-stream flow levels. Second, the fate of water rights on lands that are irrigated with reclaimed water has caused concern.

Legislation passed by the State of Oregon addresses these concerns as follows:

- No separate water right would be required for reclaimed water use. However, DEQ permits, considered equivalent to water rights, must be obtained for reclaimed water use.
- A municipality would not be required to offset the removal of discharge reclaimed water from a stream if the water were reused for beneficial uses. Use on tree farms would be a beneficial use.

- Water rights on lands using reclaimed water could be moved to other lands through a transfer process.

Public/agency review of previous proposals for the proposed project have indicated concern about the potential impacts to socioeconomic conditions in the project study area resulting from reduction of water flow to Rickreall Creek. This option may result in potential direct, indirect, short-term, and/or long-term adverse effects to farming operations that rely, in varying degrees, on water withdrawals downstream from the existing effluent outfall into the stream, and to the associated farming community. Indirect socioeconomic impacts that could result from displacing water from the stream include reduction of water available for up to 86 certified water rights holders who may use water for irrigation downstream from the existing outfall.

Socioeconomics

Reduced amounts of irrigation water, especially during the peak use periods of August and September, would reduce the productivity of some agricultural crops grown on serviced fields. In a worst case analysis including all certified water rights with points of diversion downstream from the current outfall, this could affect up to around 1,160 irrigated acres obtained through around 86 certified water rights. Based on co-occurrence of the names associated with each of the water rights holders, at least 25 of the water rights may be associated with around 12 right holders (possibly representing 12 farming operations).

Reduced amounts of potentially available irrigation water could preclude production of some crops, particularly during low-flow years when larger amounts of irrigation water would likely be required, and water that would be available during normal flow years would likely be less. Reduced amounts of available irrigation water would not necessarily preclude agricultural use of the affected properties, but could result in a change from irrigated to dry land farming crops and activities. Such a change would not be expected to exact an extensive adverse impact to the regional agricultural economy. However, the reduced water availability and switch to dry land farming could result in substantial adverse impacts to the range of crops potentially grown on lands now irrigated with flow in the stream, and to the economic operating margins and to the income of individual farm operators. Such impacts to individual farming operations could have additive adverse impacts to farming supply and service businesses in the Independence and Rickreall area, but would not be reasonably expected to exact substantial adverse effects to these businesses because of the large geographical areas and number of farming operations apparently served by these businesses.

A complete assessment of the potential socioeconomic impacts to the farming community would require an extensive review of water right priority dates of each holder and court decisions/legal opinions to determine the parameters of actual water rights, evaluation of historical and current uses of irrigation water on specific crops grown by specific farmers, and assessment of the values of these crops.

Measures to offset the potential impacts to the farmers who may be legitimately impacted by the reduction of potentially available water (considering the juxtaposition of water rights and historical use), could include augmentation of Rickreall Creek flow, providing alternative water sources such as groundwater wells (although there are potential groundwater extraction limitations associated with this), and/or delivering treated (including chemically treated) effluent to the farmers via pipelines to allow potential diversification of crops grown (although food processors are hesitant to accept any crops grown using any effluent irrigation).

Conversely, the financial cost incurred by the residents of Dallas to develop this basic alternative, including land acquisition costs, and operation and maintenance costs associated with the treatment plant expansion and irrigation development and management, would be substantial as discussed earlier in this chapter under "Cost Evaluation." Additionally, the financial cost of implementing mitigation measures to offset the potential impacts to the farming community would increase the overall costs of this option.

Natural Habitat

Short- and long-term effects to upland and stream-related natural habitat would occur under this option. Short-term effects to upland habitats would result from construction of the pipelines between the WWTF and the storage ponds and between the storage ponds and irrigation sites. Long-term upland habitat effects would result from construction and operation of the storage ponds, and to conversion of existing habitats on agricultural properties dedicated primarily to production of grass crops to wood fiber crops.

Because no in-stream construction would occur under this option, no short-term effects to stream-related habitats would be expected to result from this option. Potential long-term effects to stream-related habitats could result from relocating stream-discharged effluent to upland irrigation sites.

Upland Habitats (Non-Aquatic and Non-Wetland). Overall, native plant communities in the project vicinity have been drastically altered by human-related changes to the landscape predominately related to agricultural, transportation (roads and railroads), and/or residential developments. Agricultural land use patterns in the project vicinity have formed large expanses of mostly grass seed, grain, or hay crop fields that, due to intensive management, substantially reduce habitat values. Some isolated patches of deciduous tree groves, and scattered linear fencerows consisting of primarily ruderal vegetation communities, provide largely disconnected habitats for limited species, none of which are expected to be critical or unique and are rather widely found in the project vicinity. Land management generally limits species diversity and complexity.

Construction of pipelines along roadways would result in short-term (temporary) impacts to the ruderal habitats along the roadways. Along most potential pipeline segments, however, ruderal roadside vegetation would probably be reestablished shortly after construction. Pipelines through agricultural fields would not be expected to adversely impact important habitats. Limiting pipeline construction within fencerows would help maintain what little connectivity (corridors) between areas that are provided by such linear, ruderal habitats.

Construction and operation of storage ponds would convert approximately 500 acres of limited habitat value agricultural fields. Some fencerow habitat may be removed, minimally impacting the limited habitat connectivity in the area. Conversely, the storage ponds could provide additional temporary holding sites for migratory waterfowl.

Approximately 900 acres of agricultural properties dedicated primarily to production of grass crops would be converted to wood fiber production. This conversion would result in minimal adverse impacts and substantial beneficial impacts to wildlife habitats. The conversion would minimally affect species that are adapted to highly disturbed areas and that use the existing highly managed agricultural fields (e.g., earth dwelling species). Some localized displacement of species might occur, but this is not considered significant given the abundance of agricultural land in the area.

Conversely, poplar tree production, which would include moister ground conditions, less (if any) use of herbicides and pesticides, and some grassy and herbaceous undergrowth in addition to the tree canopy, would result in improved habitat structure and diversity (e.g., trophic, vertical, horizontal, niche), and likely increased species diversity and richness. Habitat enhancement could be increased by:

- Designing horizontal patterns of the tree groves and buffer areas to maintain habitat connectivity between the isolated existing coniferous tree groves, riparian areas, and fencerows
- Planting for phased harvests, that when combined with the horizontal pattern above, would maximize connectivity between areas and help stabilize vertical structure by not universally eliminating all vertical structure in the tree grove habitat by having one massive clear cut.
- Planting native grasses and shrubs within buffer areas between the tree crops and adjacent properties to increase natural habitat niches, soften habitat boundaries, provide additional diversified corridor opportunities for species that would be unaffected by tree harvests, and enhance overall habitat values in the area.

Aquatic Habitats (Non-Wetland). The aquatic resources reconnaissance survey of Rickreall Creek identified potential aquatic habitats for fish and other aquatic organisms. Identification of habitat types was based on physical characteristics, and does not necessarily signify actual use of the habitats by species that might use the habitats for part or all of their life cycles.

Overall aquatic habitat in Rickreall Creek generally improves beginning at its confluence with the Willamette River upstream to the existing WWTF, with relative fair ratings ranging from moderate to good ratings, respectively. Aquatic invertebrate production and diversity appear to be low in the lower reaches of the stream, with improved (rated good) abundance but with low species diversity nearer the existing outfall, indicating potentially impacted habitat.

The primary fish habitat type contained in the affected portion of the stream is glide habitat (60 percent) with pool habitat (30 percent) and riffle areas (10 percent) providing the remainder. For salmonids, the glide and pool areas are typically used for adult and juvenile passage. Quality spawning habitats, comprising approximately 10 percent of available habitat, are located in the upper 2.0 miles, nearest the existing outfall. Resident cutthroat trout spawning habitat is more prevalent than anadromous spawning areas, although resident cutthroat trout spawning areas were typically rated only fair in quality.

The predominant limiting factors impacting overall fishery resources in this downstream area appear to be lack of adequate spawning areas and absence of off-channel or backwater overwintering areas. The factors limiting salmonid use include poor salmonid habitat (high percentage of silt/organic substrate, low hydraulic diversity), degraded water quality, flushing high winter flows, limited (off-channel or backwater) overwintering habitat, and high summer water temperatures. These limiting factors probably contribute to the ODFW's designating the lower reaches of the stream as a salmonid passage rather than salmonid producing waters. ODFW's designation of "salmonid producing" versus "salmonid passage" waters depends largely on documentation. To be designated "salmonid producing" waters, salmonid (resident or anadromous) spawning and rearing utilization must be documented to occur in the area. "Salmonid passage" relates to salmonids utilizing the area for migratory purposes while enroute to known spawning or rearing areas. In other words, spawning or rearing (other than the time needed to move through the area) is unlikely and has never been documented in the area designated as "salmonid passage." There is no evidence of the stream reaches below the outfall supporting anadromous spawning or rearing. There are documented salmonid spawning and rearing areas upstream of the WWTF (ODFW, personal communication, 1995).

Based on field observations, the existing limiting factors affecting the overall quality of aquatic resource habitats along the creek (particularly during low-flow summer months) include degraded water quality (dissolved oxygen, increased nutrients, chemical contamination, and increased summer water temperature) primarily resulting from industrial and municipal effluents, agricultural nonpoint pollution, lack of spawning gravels, overwintering habitat, and adequate large woody debris. Based on water quality sampling done for the project, non-point pollution to the stream from agricultural activities appears to be very low during low flow periods when runoff from agricultural fields is very limited.

Based on a bioassessment conducted for the existing treatment plant outfall (Biosurvey and Bioassessment for Rickreall Creek, Technical Memorandum to the City of Dallas from Richard Raymond, December 14, 1995), the existing discharge appears to adversely affect aquatic invertebrates in the vicinity of the treatment plant. For example, there are fewer numbers of individuals found downstream of the facility than are found upstream.

Diverting effluent that would otherwise be discharged to Rickreall Creek would result in impacts to the interaction of water quality and quantity in the stream. Water withdrawals associated with this project are generally expected to be within the normal variance for all but the lowest flow periods. Consequently, during high winter and spring flows, the reduction in stream flow resulting from displacement of the current effluent discharge would be expected to have a minimal adverse impact on the stream's aquatic habitats. However, during typical yearly low flow periods, usually occurring from August through mid-October, displacement of effluent discharge could adversely affect water quantity downstream from the existing outfall by reducing flows (just downstream from the outfall) from approximately 9 cfs to 15 cfs to 5 cfs to 9 cfs. Reducing flow would intensify water quality degradation, particularly with respect to increasing water temperature and decreasing dissolved oxygen, and concentrating pollutant loads (placing existing effluent into the stream would actually decrease water temperature). These impacts would most importantly affect the potential habitat quantity and suitability of summer holding pools and glides for migratory salmonids, although the extent of these impacts is not precisely known because the extent of anadromous and resident salmonid use is unknown. In unusually severe drought years, when the effluent discharge essentially provides all of the streamflow immediately downstream of the current outfall, displacement of effluent discharge could severely impact stream habitats because streamflows could potentially become intermittent. However, during drought years, other limiting factors, primarily extreme low flow and degraded water quality, would potentially render summer habitat, for example glides and holding pools, substantially limited at best.

The primary impact to resident species in Rickreall Creek caused by lower low flows would be from a reduction in potential habitat, isolation and stranding of fish, degraded water quality, and probable passage impediments. Water quality would also be affected by lowered low flows. These impacts primarily include increased water temperatures and lowered dissolved oxygen levels. However, contaminant concentrations from point and nonpoint sources could be heightened because of lower in-stream dilution factors.

Without flow augmentation, summer flows will be lower and could have a significant deleterious affect on anadromous and resident fish that use Rickreall Creek by increasing environmental stress factors and facilitating population level declines.

Long-term effects to natural habitat might occur under this option. The ODFW has expressed concern about chronic low flow conditions in Rickreall Creek that are a contributing factor in the primary causes of poor water quality and fish habitat in the stream. Flow reductions in Rickreall Creek might further reduce the suitability of fish habitats in the stream.

Wetlands/Riparian Areas

The large amount of land area and the substantial modifications to land uses required by this option would probably result in the highest potential of all the options to have long-term affects on jurisdictional wetlands. However, wetlands affected by this option's new pipeline, pond, and irrigation facilities are likely to be of low value.

In addition to mitigation that might be required by Section 404 of the Clean Water Act for impacts to wetlands resulting from outfall modifications, pond construction, effluent irrigation on jurisdictional wetlands would require an NPDES permit from the Oregon DEQ for discharges to the waters of the U.S.

Rickreall Creek is a highly entrenched and contained stream channel with generally vegetatively stable banks that are supported primarily by a narrow (typically 10 to 20 feet wide) deciduous riparian area and an understory of predominantly blackberry. These conditions limit the wetland functions along the stream channel to primarily muddy aquatic beds. Other wetlands located beyond the stream channel area appear to be reliant upon upland runoff hydrology or seeps, and not upon hydrology associated with Rickreall Creek bank storage.

Reductions in water quantity resulting from displacement of effluent discharge into the stream could result in seasonal extension of riparian vegetation further into the stream channel than would typically occur. Some muddy aquatic beds may host invasive, fast-growing plant species that would later be inundated and flushed away during subsequent high-flow periods. Since bank storage would be reduced, riparian vegetation and habitats located furthest from the stream may experience water deprivation. During severe drought years, some plant species or individual plants within the area would be expected to die. Because of the limited functional values of the stream-related wetlands and the overall heartiness of the typically ruderal plant species comprising the riparian habitats, typical reductions in summer water flow during the summer months would not be expected to result in significant impacts to wetland or riparian habitats along the stream.

Floodplains

Possible locations for effluent storage pond(s) near the WWTF and Rickreall Creek could be limited by flood-prone areas associated with Ash Creek south of the WWTF and southeast of the intersection of Bowersville Road and Orrs Corner Road.

Ground-disturbing activities that could affect flood elevations may require a floodplain development permit, issued by Polk County.

Cultural and Historical Resources

The large amount of land area and the substantial modifications to land uses required by this option would probably result in the highest potential of all the options to affect cultural resources. If agricultural fields north of Rickreall Creek and along Bowersville Road were used for effluent irrigation or sludge land application, the historic Jefferson Institute site might be adversely impacted. The extent of these impacts would depend upon the existing integrity of any archaeological remains of the site and the amount of ground disturbance that would be caused by land application activities. Project delays could occur if archaeological sites are discovered.

Visual, Noise, and Odor Impacts

A large pond, a series of ponds, and/or tree crops located south of the WWTF might result in adverse and long-term effects to rural viewsheds from residences in the near vicinity and from those on the flanks of Mount Pisgah. These effects are not expected to be substantial.

Noise impacts resulting from construction of the ponds and pipelines might result in short-term adverse effects to residences near the excavation sites. Noise from tree harvesting would affect nearby residences; however, such noise impacts would not be substantially dissimilar from normal farm operations currently occurring in the area. However, few noise-sensitive residences are expected to be substantially affected because of their widely dispersed distribution in the rural landscape.

Effluent irrigation of tree crops might result in some long-term impacts to air quality due to odors emitting from irrigation. However, the scattered distribution of rural farm-related dwellings in potentially affected areas, plus provision of adequate buffer areas between irrigation fields and residences, would minimize the extent of possible odor impacts.

Removal of effluent odor from Rickreall Creek could result in long-term benefits to recreational activities along Rickreall Creek.

System Option 2

System Option 2 consists of Rickreall Creek Discharge/Summer Irrigation. This option would have similar, but generally less substantial, effects than the No Discharge with Winter Storage and Summer Irrigation option. Differences between System Option 1 and this option are discussed below.

Land Use Compatibility

Construction of the WWTF effluent pipeline system along existing roadways would probably temporarily affect access to fewer residences because of the reduced area required for irrigation. The pipeline route for the separate industrial treatment would generally follow the same route as that proposed for the Ash Creek Interceptor from Praegitzer Industries to Orrs Corner Road. At Orrs Corner Road, the alignment would diverge from the interceptor route and parallel the road to the vicinity of the WWTF. Construction of these pipelines would result in insubstantial impacts to short-term and long-term land uses, although development above the pipeline easement would be precluded. Storage ponds (combined ponds for WWTF effluent and separate industrial treatment) would probably require long-term conversion of about 15 acres of agricultural land, or about 485 acres less than that required for ponds under winter storage with summer discharge. Because of the smaller area required for the ponds, topographic relief, roads, and ownership patterns are less constraining than under the perennial irrigation option.

An effluent irrigation system would require conversion of approximately 320 acres of agricultural land primarily dedicated to grass production to wood fiber production. This is not expected to result in adverse effects to adjacent or nearby farm operations. Irrigation will benefit productivity potential of the fields, and would not adversely affect the long-range options of crop types that could be grown on the properties.

Zoning and Permitting Requirements

Affected properties would be zoned similar to those affected under System Option 1. Fewer acres of EFU land would affected by land use conversions. Permit requirements would be similar but would be presumably less complicated than those under System Option 1.

Portions of the separate industrial treatment pipeline would be constructed within the City of Dallas, and within the City's land use jurisdiction. Polk County land use zones potentially crossed would include Exclusive Farm Use, Acreage Residential, and Suburban Residential. City of Dallas land use zones crossed could include Residential Agricultural, Residential Single-Family, Residential High Density, and Planned Unit Development. A conditional use permit may be required from Polk County for segments of the pipeline lying in private property. The conditional use permit process may have to include special reviews for any significant resource areas affected (although it is expected that such resource areas could be avoided by rerouting or by using standard and/or special construction techniques). No City land use permits would be required. Right-of-Way Access permits would be required from both jurisdictions for public roadway crossings.

Any construction of wastewater treatment facilities (e.g., a disinfection facility at the Praegitzer Industries property) would require City permit modifications for the existing industrial site.

Recreational Impacts

This option would probably result in less adverse effects than System Option 1 to the following recreational uses:

- Recreational activities occurring near or downwind from the storage ponds or effluent irrigation areas.
- Temporary access limitation to some public recreational activities.
- Fishing opportunities resulting from potential loss of fish habitat

This option would probably result in less beneficial effects than System Option 1 to recreational activities involving water contact downstream in the Willamette River.

Water Rights

Because of discharges into Rickreall Creek under this option, effects to overall water rights downstream from the current outfall location could be less substantial under this option than under System Option 1. However, effluent discharge into the creek during dry periods probably would not occur when water is most needed for some crops.

Socioeconomics

Although reduced amounts of irrigation water would reduce the productivity of some agricultural crops grown on serviced fields, similar to System Option 1, the overall impacts to farms and the farming community would be substantially less under System Option 2, which would require less diversion of effluent to the stream. Although effluent would be diverted to holding ponds for disposal onto poplar irrigation fields during the driest months of the year when the water may otherwise be important for some crops grown downstream from the treatment plant, stream flow would be maintained during some of the other summer months when the water could be used for irrigating other farm crops during their growing seasons.

Conversely, the financial cost incurred by the residents of Dallas to develop this alternative, including land acquisition costs and operation and maintenance costs associated with the treatment plant expansion and irrigation development and management, would be substantial, but less substantial than System Option 1, as discussed earlier in this chapter under "Cost Evaluation." Additionally, the financial cost of implementing mitigation measures to offset the potential impacts to the farming community would increase the overall costs of this option, but to a lesser degree than System Option 1.

Natural Habitat

Because of potentially longer periods of normal flows in Rickreall Creek, and less extensive land conversions required by this option, it is expected there will be fewer substantial impacts than System Options 1 and 3.

The proposed pipeline from Praegitzer Industries to the storage ponds would cross Ash Creek and would result in potential impacts to riparian habitat. Pipeline trench excavations and long-term maintenance requirements could permanently alter the riparian and aquatic habitats by altering streambed characteristics, temporarily increasing turbidity, and removing and restricting growth of trees. These impacts could adversely affect local populations of some species, but the effects are not expected to be substantial. In-stream pipeline construction would be limited to the July 1 to October 1 in-water work restrictions for Rickreall and Ash Creeks.

Potential impacts to low value natural habitats in managed agricultural fields would not be substantial. No sensitive species survey has been conducted of possible pipeline routes for this suboption. Project delays could be caused by seasonal restrictions imposed by the need to conduct surveys during limited periods during which some species (and/or their potential habitat) can be located.

Wetlands

Because of the fewer number of acres required by this option, its potential effects on wetlands would be similar but potentially less extensive than those under System Option 1. The proposed pipeline for the separate industrial treatment would cross Ash Creek, which is identified on the National Wetland Inventory maps as a riverine, perennial, unconsolidated bottom, permanently flooded wetland. Hydric soils are common in the areas where the pipeline might cross.

Floodplains

Because of the fewer number of acres required by this option, its potential effects on floodplains would be similar but potentially less extensive than those under System Option 1. Very limited to no potential impacts are expected to occur to floodplains resulting from construction and operation of the pipeline, storage ponds, and effluent irrigation fields associated with the separate industrial treatment.

Cultural and Historical Resources

Because of the fewer number of acres required by this option, its potential overall effects to cultural resources would be similar but potentially less extensive than those under System Option 1.

With respect to the separate industrial treatment facilities, areas along Ash Creek have a moderate potential to contain archaeological resources. Other areas potentially crossed by the pipeline and/or affected by the construction of the storage ponds and effluent irrigation fields are on upland areas that would be expected to have lower potential to contain archaeological resources. The extent of impacts to potentially important prehistoric and historic cultural resources can be determined only after a pipeline route is defined.

Visual, Noise, and Odor Impacts

Because of the fewer number of acres required by this option, its potential overall effects on viewsheds and noise- and odor-sensitive land uses would be similar but potentially less extensive than those under System Option 1. Construction along the proposed separate industrial treatment pipeline route could result in short-term adverse effects to people residing in the relatively low- to medium-density developments near the existing Praegitzer Industries' facilities, and along Orrs Corner Road. These impacts are not expected to be substantial and would be limited to no more than 5 days near any one residence.

System Option 3

This option, Willamette Discharge/Demand Irrigation, includes only the proposed pipeline route that would generally follow existing, abandoned, and transferred segments of the Southern Pacific Railroad tracks running from Dallas to West Salem. The route that would follow Highway 22 has been eliminated due to other considerations discussed previously.

Land Use Compatibility

This alternative would displace water from Rickreall Creek that if discharged to the stream might be available for downstream agricultural users. Public/agency review of previous proposals for the proposed project has indicated concern about the potential impacts to socioeconomic conditions in the project study area resulting from reduction of water flow to Rickreall Creek. The option may result in potential direct, indirect, short-term, and/or long-term adverse environmental effects to farming operations that rely on water withdrawals downstream from the existing effluent outfall into the stream, and to the associated farming community. Reduced access to irrigation water could affect the Natural Resources

Conservation Service's "Prime Farmland" classification of some agricultural lands near the creek. Conversely, the economic costs potentially incurred by the residents of Dallas and the environmental costs of measures to offset the impact to the farming economy could also be substantial. The City and DEQ have determined that these effects will be evaluated and/or documented in detail as part of the supplemental documentation required for the EA.

Approximately 0.15 miles of the proposed pipeline route would be located on the east side or in the County right-of-way along Bowersville Road south of the WWTF.

Construction in any new pipeline right-of-way on the north side of the currently functional Southern Pacific Railroad tracks would probably preclude agricultural use of the property for one season. Construction of the pipelines may affect agricultural irrigation and/or underground drainage tiling systems that facilitate farming activities permitted on agricultural properties. If the City cannot reestablish the lines to allow equivalent use on the affected property, damage payments to those owning the affected property would be needed to compensate for the loss in value to the serviced property. Any displacement of such irrigation or drainage facilities would not be expected to preclude agricultural use of the properties; however, the long-term economic productivity of the properties may be adversely affected. This in turn could adversely effect the overall agricultural-related economy in the area, particularly businesses related to agricultural crop distribution and/or agricultural supply businesses in Rickreall or Independence. However, given the amount of potentially affected area relative to the extensive area contributing to the agricultural economy centered in these communities, and that the affected fields could continue to produce agricultural goods, the impacts are not expected to be substantial. Given that some of the farming operations that might be affected are focused on irrigated vegetable/fruit crops, change from irrigated to non-irrigated or drained to non-drained operations could require important machinery expenditures by the farm operators.

Construction might also temporarily affect the agricultural industrial operations along the north side of the tracks near Rickreall. Long-term impacts to adjacent activities along this segment of the pipeline route would include infrequent maintenance activities that may require temporary disturbance of agricultural production in the right-of-way.

Construction in the abandoned section of the Southern Pacific Railroad right-of-way east of the mainline might have short-term adverse effects on vacant land that is either graveled and has served as agricultural access roads, is covered with grass, or is overgrown with dense vegetation.

Short- and long-term effects might occur to the 11 properties along the old railroad alignment that are in individual private ownerships. Short-term impacts might affect the nonintensive and adjacent uses on these properties. The project might preclude certain long-term uses (such as housing development) on the 11 properties.

Construction of the pipeline would result in temporary access disruptions to the following developments:

- Two houses and the Salem Yacht Club Marina
- Highway 97, Morrow Road, Greenwood Road, Independence Highway, Eola State Farm Road.

The Southern Pacific Railroad would be bored.

Access disruption at any one point would probably last a maximum of about 5 days, during which time some temporary access might be feasible. Some loss of business to commercial/industrial properties might occur.

Pipeline construction could temporarily sever utility services provided by underground utilities within the potentially affected rights-of-way. Interruption of services would be expected to last no longer than a few minutes.

The pipeline would not be expected to have any substantial long-term effects to overall land use patterns in the project area. Further development would be precluded on the property at the eastern terminus of the pipeline.

The outfall would be constructed in the Willamette River on private and state-owned property.

Because the pipeline route would traverse generally undeveloped areas and would bore under Highway 99W, disruptions to traffic in the project area during construction would not be substantial.

Zoning and Permitting Requirements

This alternative would occur entirely within Polk County's land use jurisdiction. The affected lands crossed by the proposed route are variously zoned Exclusive Farm Use, Acreage Residential, Farm Forest, Commercial Retail, and Industrial Park or Light Industrial. Impacts to development on the commercial and industrial zoned properties would not be expected to be substantial.

Except for the approximately 0.15-mile segment of the proposed route in public right-of-way along Bowersville Road, all of the proposed route would require a conditional use permit issued by Polk County.

This option would also require a Section 10 permit for construction of an outfall in a navigable waterway of the U.S., and possibly a Section 404 permit for impacts to wetlands.

Recreational Uses

This alternative would discharge treated effluent into the Willamette River. Recreationists using areas downstream from the proposed outfall might perceive that the effluent could adversely affect the health of people engaged in water-contact activities. Areas or facilities where water-contact recreational activities might be most intensive include the Salem Yacht Club Marina, Wallace Marine Park, and Mintow-Brown Island Marion County Park.

However, because of the secondary-level treatment (with additional filtration) proposed under this option, and the substantial dilution afforded by the Willamette River flow, public safety is not expected to be affected. Possible visual and odor impacts to recreational activities are discussed later in the Visual, Noise, and Odor Impacts subsection.

This alternative might also involve temporary disruption of access to the Salem Yacht Club Marina. Impacts are expected to be minimal.

The alternative would also involve removing flow from Rickreall Creek, which might adversely affect recreational fishing by potentially reducing the quality of the fish habitats.

Water Rights

The effects of the alternative on water rights, resulting from reduced streamflow in Rickreall Creek downstream of the WWTF, would be very similar to those described for the No Discharge with Winter Storage and Summer Irrigation option. However, the potential impacts could be less if farmers use effluent for agricultural crops on an on-demand basis. Costs for extending pipeline connections to the effluent outfall pipeline would be incurred by those wishing to use the water for irrigation.

Natural Habitat

This alternative would reduce flows in Rickreall Creek to the same extent as the No Discharge with Winter Storage and Summer Irrigation option (discussed below). Flow reductions in the stream would have the same potential to affect fish habitats as would System Option 1.

Streams crossed or entered by the proposed pipeline in this option include:

- Rickreall Creek, approximately 0.33 miles east of the route's Independence Highway crossing
- Willamette River (proposed outfall), at approximately river mile 88.9 (Class I Stream)

Trench excavations proposed under this option could permanently alter riparian habitats along the aforementioned streams. To preserve pipeline integrity, trees and deeply rooted shrubs would not be permitted to grow over the pipeline. Construction could also alter streambed characteristics and temporarily increase sedimentation in the streams. These impacts could affect local populations of some species, but the affects are not expected to be substantial. Construction of a pipeline crossing Rickreall and Ash Creeks will be subject to the July 1 to October 1 in-water work restrictions.

The potential long-term impacts to the natural habitat of Rickreall Creek would be essentially the same as those described for System Option 1.

Overgrown portions of the abandoned right-of-way probably support various habitats for several species. However, such hedgerow habitats are not unique to the abandoned segments of the route and substantial impacts on wildlife resulting from conversion of the right-of-way are not expected.

This alternative may affect sensitive species habitat particularly along riparian areas. Potential delays in construction caused by seasonal survey restrictions and/or by limited construction windows might be more likely to occur under this alternative than the other options.

Wetlands

This option would require substantially less land conversion than the reuse options discussed previously. Consequently, this option would potentially affect fewer and less extensive wetlands than would the reuse options.

This alternative might cross or enter four wetlands identified on the National Wetlands Inventory maps:

- A riverine, lower perennial, unconsolidated bottom, permanently flooded wetland on Rickreall Creek
- Open water, the Willamette River at the proposed outfall

Hydric soils, which could indicate wetland conditions, characterize approximately 1.4 miles of the proposed route. Additional segments of the route may cross small hydric soil inclusions that are not mapped.

Approximately six culvert and ditch crossings between Bowersville Road and Independence Highway appear to involve wetland permitting issues. Stream crossings and in-stream work at Rickreall Creek and the Willamette River appear to be unavoidable. Wetlands occur east of Independence Highway, close to the former railroad alignment at the toe of the slope. Necessary steps would be required to minimize construction impacts to these wetlands. Further east, standard construction practices should prevent impacts to Rickreall Creek.

Wetland mitigation requirements could have substantial secondary land impacts.

Floodplains

This option would require substantially less land conversion than the reuse options. Consequently, this proposed option would potentially affect fewer floodplain and floodway areas than the reuse options.

This proposed alternative would cross approximately 3,900 and 400 linear feet of Zone X and Zone A floodplains, respectively. The option would also cross approximately 300 linear feet of the Willamette River floodway.

Cultural and Historical Resources

This option would require substantially less land conversion than the reuse options and would have less potential to affect cultural resources than these reuse options. This option would have less potential to delay the project due to cultural resource survey and possible mitigation requirements than the reuse options.

This alternative would cross Rickreall Creek and a bank of the Willamette River, areas that are likely to contain cultural resources. The option would parallel the edge of the Rickreall Creek floodplain. Because the interfaces between floodplain and upland often contain cultural resources in the project area, this alternative may be more likely to affect cultural resource sites than the reuse options.

Visual, Noise, and Odor Impacts

Because the proposed pipelines would be underground and no storage ponds are involved, both alternatives would have substantially less long-term visual impacts than the reuse options.

Odor from the effluent outfall may have very localized long-term effects on water-related recreational activities in the Willamette River. The effects may be more noticeable during low flow periods in the river. However, secondary treatment with filtration would produce effluent that would not be expected to have significant effects to the odor of the Willamette River. Enjoyment of recreational activities in and along the river would not be substantially affected by odor from the outfall.

Short-term impacts to the viewsheds and noise levels resulting from construction of the outfall pipeline along the option would not be expected to be substantial. The low density of sensitive developments along the pipeline route option would minimize visual and noise effects.

System Option 4

Land Use Compatibility

By involving a substantial increase in the size of the WWTF, this option would require permanent conversion of adjacent agricultural land to public facility uses. Because only part of one property would be required for the expansion, and the property is currently used primarily for grazing purposes, the impacts to nearby agricultural activities, and regional agricultural land use patterns would not be expected to be substantial.

Zoning and Permitting Requirements

The treatment plant expansion would require a Comprehensive Plan and Comprehensive Plan Map amendment, a zone change, and an exception to Statewide Planning Goal 3 (Agricultural Lands) from Polk County, to allow redesignation of the property as Public Services. These planning actions would need to illustrate that this option is needed (including illustration that a facility within the Dallas Urban Growth Boundary could not reasonably satisfy that need), what the relative benefits and disadvantages of this option are compared to other options, and that adjacent agricultural uses would not be adversely effected.

Recreational Impacts

No adverse impacts to recreational activities would be expected from this option. Beneficial effects would include improving water quality of Rickreall Creek fisheries used by anglers, and for downstream water contact sport users in the Willamette River.

Water Rights

Because all effluent would be returned to Rickreall Creek, there would be no effects on water rights downstream from the WWTF.

Unlike the other system options reviewed in this chapter, System Option 4 would not result in potentially adverse socioeconomic impacts to the farmers and farming community generally located downstream of the existing outfall. Agricultural irrigation could continue without municipal wastewater treatment diversions from streamflow in the creek.

However, as described in the "Cost Evaluation" and subsequent "System Option Selection" subsections of this chapter, the financial cost of this alternative would impose severe economic hardship on the City of Dallas and the sewage rate payers.

Natural Habitat

Expansion of the treatment plant would convert agricultural property, having low natural habitat value.

Combined, improving the water quality effluent discharge to Rickreall Creek and maintaining the stream flow to near existing conditions would improve overall aquatic habitat conditions and potential utilization of the stream by aquatic resources. As indicated previously, water quality, as partially determined by the natural streamflow and the wastewater treatment plant's effluent discharge, is a limiting factor for aquatic inhabitants in the stream. However, the stream's water quality and quantity with respect to maintaining or enhancing aquatic habitats, would continue to be adversely affected by other nonpoint sources of pollution (e.g., agricultural and/or roadway runoff), and other water diversions (e.g., agricultural irrigation). However, these adverse impacts would be partially or fully mitigated by the increased water quality (near potable) and quantity of discharge from the WWTF outfall. Water quality enhancement would be most pronounced at times when the WWTF effluent contributes most if not all of the flow to Rickreall Creek. Enhancement of Rickreall Creek flow quantity during periods of low flow (summer) is critical for maintaining downstream beneficial uses by aquatic resources by increasing and maintaining available aquatic habitat in addition to supporting important agricultural uses.

Wetlands

Except for possible wetland impacts discussed with reference to the "Onsite Plant Expansion Impacts," this option would be expected to have very limited potential for additional impacts to wetlands. Any wetlands on the agricultural property located south of the existing treatment plant would be under agricultural uses, thereby limiting its current wetland values and functions.

Floodplains

With approximately 300 feet of potential impacts to Zone A floodplain along Rickreall Creek north of the WWTF site, this option would involve substantially less floodplain impact than the other three options.

Cultural and Historical Resources

Most of the expansion of the treatment plant under this option would result in similar potential impacts to cultural resources as those described for the "Onsite Plant Expansion Impacts." Because of its relative proximity to Rickreall Creek, the agricultural property south of the existing treatment plant has a moderate probability of containing archaeological resources.

Visual, Noise, and Odor Impacts

Because it would include construction activities on the more visible agricultural land south of the existing treatment plant, this option would have more extensive short-term effects on views from, and noise impacts to, nearby residences than those effects described for the "Onsite Plant Expansion Impacts." The effects could be minimized by standard measures that include, for example, limiting construction hours and the amount of idling construction equipment, reducing vehicle speeds of construction vehicles on area roads, and requiring use of mufflers on all equipment.

The noncost impacts of all four system options are summarized in Table 7-12.

System Option Selection

A cost-effectiveness summary for the system options is presented in Table 7-13. The noncost scores from Table 7-12 are first converted to positive benefit scores. The present worth cost for each option is then divided by its benefit score to yield a cost/benefit ratio.

Table 7-13 shows that the Rickreall Creek discharge with summer irrigation option has the lowest cost/benefit ratio. This option has a slightly higher present worth cost than the Willamette River discharge/demand irrigation option. However, this higher present worth cost is offset by the much higher level of noncost benefits.

Continued discharge to Rickreall Creek, particularly in summer, clearly provides significant environmental benefits. Water resources and natural habitats are enhanced and several socioeconomic advantages are gained. These positive impacts are clearly reflected in the high positive environmental impact score for System Option 4, Year-round Rickreall Creek Discharge, in Table 7-12. However, this option is also technically the most intensive and therefore scores low on technical feasibility. It also incurs the highest present worth cost of all options—more than twice that of System Options 2 or 3. System Option 2, Rickreall Creek Discharge with Summer Irrigation, lacks the environmental benefits associated with summer discharge to the creek, but is technically less intensive and less expensive. It is a compromise that attempts to provide optimum balance between environmental benefits, regulatory compliance, and cost. This is reflected in the lowest cost/benefit ratio in Table 7-13. System Option 2, Rickreall Creek Discharge with Summer Irrigation, is therefore recommended for liquid treatment improvements at the Dallas WWTF.

The high cost and technical intensity of System Option 4 is largely the result of advanced treatment required to address high influent metals concentrations. System Option 2 is able to control the treatment cost by providing separate treatment for concentrated metal-bearing industrial wastewater. This allows winter discharge to the creek with less intensive treatment. However, recognizing the significant potential environmental benefits, the possibility of summer discharge by adjusting the treatment level provided in System Option 2 is evaluated in Chapter 9. The evaluation in Chapter 9 attempts to further optimize treatment levels with disposal requirements.

Table 7-12
System Option Noncost Impact Summary

Impact Criteria	(1) No Discharge: Winter Storage/ Summer Irrigation	(2) Rickreall Creek Discharge with Summer Irrigation	(3) Willamette River Discharge/ Demand Irrigation	(4) Year-Round Rickreall Creek Discharge
	System Option Impacts			
Technical Feasibility				
Ease of implementation	0	+	-	-
O&M characteristics	0	0	+	-
Performance reliability	+	0	0	-
Flexibility	-	+	0	-
Energy use and resource recovery	+	+	0	-
Future regulatory compliance	+	-	0	-
Technical Feasibility Subtotal	**+2**	**+2**	**0**	**-6**
Land use compatibility	0	0	-	-
Zoning/Permitting	0	0	-	-
Recreational impacts	0	0	-	0
Water resources	-	0	-	+
Socioeconomic	-	-	-	+
Natural habitat	-	-	-	+
Wetlands	-	-	0	+
Floodplains	-	-	0	0
Cultural and historical resources	-	-	0	0
Visual, noise, and odor impacts	-	-	0	+
Environmental Impact Subtotal	**-7**	**-6**	**-6**	**+3**
Overall system option noncost score	-5	-4	-6	-3

Key:
+ Positive impact
0 No impact
- Negative impact
Overall system option impact = Number of positive impacts - Number of negative impacts

Table 7-13
System Option Cost-effectiveness Summary

Impact Criteria	System Option Impacts			
	(1) No Discharge: Winter Storage/ Summer Irrigation	**(2) Rickreall Creek Discharge with Summer Irrigation**	**(3) Willamette River Discharge/ Demand Irrigation**	**(4) Year-Round Rickreall Creek Discharge**
Total net present worth cost (1995 $, millions)	39.6	24.2	21.4	51.7
Overall noncost score	-5	-4	-6	-3
Benefit Score[a]	2	3	1	4
Cost/Benefit ratio[b]	19.8	8.1	21.4	12.9
Option rank[c]	3	1	4	2

[a]Highest (least negative) noncost score gets highest positive benefit score.
[b]Cost/Benefit ratio = present worth/benefit score.
[c]Lowest cost/benefit ratio ranks highest (first).

Chapter 8
Sludge Stabilization and Disposal Options

CHAPTER 8

SLUDGE STABILIZATION AND DISPOSAL OPTIONS

Introduction

Several sludge stabilization options are available to meet regulations and provide for beneficial reuse of stabilized sludge (biosolids). In this chapter, stabilization options are identified and screened for detailed analysis. Stabilization options include those that use existing facilities at the Dallas WWTF. Preliminary sizing, noncost evaluations, and estimates for capital and operations and maintenance (O&M) costs are presented for each of the screened alternatives. For sludge disposal, two options exist: landfill disposal and land application disposal (beneficial reuse). To provide flexibility for sludge disposal, each of the system options chosen for detailed analysis includes sufficient treatment capability to meet both landfill and land application regulations. Sludge quantities used for analyses in this chapter were based on the recommended liquid system option in Chapter 7.

Preliminary Options Screening

Options for sludge stabilization are listed and discussed below. The feasibility of an option is determined, among other factors, by its compatibility with other options in the overall plan and by circumstances specific to the City of Dallas.

No-action Alternative

Current disposal of sludge occurs once per year at the end of the summer when dried sludge is hauled to the Coffin Butte Landfill for use as cover material. New regulations for land disposal of sludge (40 CFR Part 503) require higher levels of treatment than the existing treatment facilities can consistently achieve. The new regulations also affect the use of sludge as final landfill cell cover material, but do not affect the use of sludge as daily landfill cover. Future regulations and landfill management may eliminate the option of landfilling sludge in favor of agricultural land application. In addition, because of increased solids loading to the existing humus ponds, removal of dried sludge has become more difficult in recent years as a result of inadequate and inconsistent dryness. Therefore, the option of using the existing sludge treatment facilities unmodified is not recommended and is not considered further.

Existing Facilities with Expanded Digestion, Thickening, and Humus Pond Modifications

This option would include use of the existing aerobic digester and humus ponds. A second aerobic digester and a gravity belt thickener would be added to extend the solids detention time. The humus ponds would be modified with improved supernatant decanting as well as asphalt lining of the ponds to improve vehicular access. A future humus pond would be added as needed to reduce solids loading per pond.

Existing Facilities with Mudcat, Lime Stabilization, and Dewatering

This option would also include use of the existing aerobic digester and humus ponds. However, this option would not rely on achieving a dried product. Instead, a mudcat would be used to remove liquid sludge from the humus ponds for lime stabilization and dewatering. Sludge would be disposed as a dewatered cake.

New Digestion, Liquid Storage, and Dewatering

This option would involve abandoning the existing solids facilities. New digestion facilities would be constructed and liquid storage would be provided in a covered tank. Sludge would be disposed as a dewatered cake.

Existing Facilities with Sludge Dewatering and Year-Round Lime Stabilization

This option would utilize the existing aerobic digester as aerated sludge storage, and would dewater and stabilize sludge with a belt filter press and lime addition, respectively. The existing humus ponds would be used as backup sludge storage if the dewatering equipment was inoperable, or landfill/land application was not possible.

Composting

Several methods of composting have been used to stabilize sludge at municipal wastewater treatment facilities. Composting involves dewatering settled sludge and then adding amendments (for example, sawdust or woodchips) to the sludge to produce a material that will hold its shape and allow easy transport. Sludge stabilization occurs within windrows or a compost pile. Because liquid treatment options do not include primary clarification (see Chapter 7), only secondary waste activated sludge would be available for composting. Secondary sludge is much thinner than primary sludge. Composting of secondary sludge alone is difficult because of dewatering limitations with belt filter presses and the increased need for amendment. For these reasons, composting is not considered further.

Incineration

Incineration involves high-temperature combustion of sludge. In addition to air quality and ash disposal permitting difficulties, incineration is not economically feasible for a treatment facility the size of Dallas'. For these reasons, incineration is not considered further.

Dewatering and Drying

This option would involve dewatering with belt filter presses and drying with a high-temperature rotary dryer to remove moisture. This option would involve air permitting and would significantly increase the complexity of current operations. Also, dewatering and drying is not economically feasible for a treatment facility the size of Dallas'. For these reasons, dewatering and drying is not considered further.

Detailed Analysis of Screened Options

The four options selected for detailed analysis are presented below. Preliminary sizing and flow schematics are also presented.

Option 1: Existing Facilities with Expanded Digestion, Thickening, and Humus Pond Modifications

A flow schematic of Option 1 is shown in Figure 8-1. Design information is presented in Table 8-1. Existing facilities include an aerobic digester with mechanical surface aeration and two humus ponds. These facilities would remain as the primary facilities for sludge stabilization.

Given the age of the existing digester, some improvements are assumed to be necessary, including adding two new sludge pumps and foam control sprays, and performing general structural rehabilitation. Lime addition to increase digester pH would be used to optimize performance.

For Option 1, the strategy for meeting the new 40 CFR, Part 503 sludge regulations is to achieve 38 percent reduction in volatile solids for vector attraction reduction and to achieve the desired degree-days for pathogen reduction (60 days at 15°C). The solids retention time (SRT) will be increased from current operation by the addition of a gravity belt thickener and a second aerobic digester. The operating temperature of the digesters will be increased by replacing the existing mechanical surface aerator with a diffused air system supplied by positive displacement blowers. The thickener and a polymer system will be housed in a building adjacent to the existing digester. Blowers and lime would be housed in the existing control building.

Asphalt lining of the humus ponds will allow greater access for equipment to remove sludge as well as redistribute sludge within the ponds to assist drying. Sloped pond bottoms will allow thinner layers of sludge to dry more quickly and be removed from the pond. Wetter sludge can then be redistributed across the pond to complete the required drying. Improved supernatant drainage would also be achieved with the addition of drainage structures containing weir gates. Supernatant would be chlorinated prior to return to the influent pump station to reduce the impact of algae on the plant. Although the modified existing facilities will meet immediate sludge storage and drying needs, a third humus pond is recommended in the future. The third humus pond will allow the ponds to be loaded at a lower rate to meet future sludge drying needs.

Option 2: Existing Facilities with Mudcat, Lime Stabilization, and Dewatering

A flow schematic of Option 2 is shown in Figure 8-2. Design information is presented in Table 8-2. As with Option 1, the existing aerobic digester and humus ponds would remain in operation. Similar improvements would be made to the existing facilities. New facilities would include a mudcat sludge removal system, a lime stabilization system, and a dewatering facility.

The humus ponds would serve as liquid sludge storage with sludge removal via a mudcat sludge dredge. The mudcat would include a cable guidance system and pumps. Sludge would be pumped from the humus ponds in a liquid form to the lime stabilization tanks.

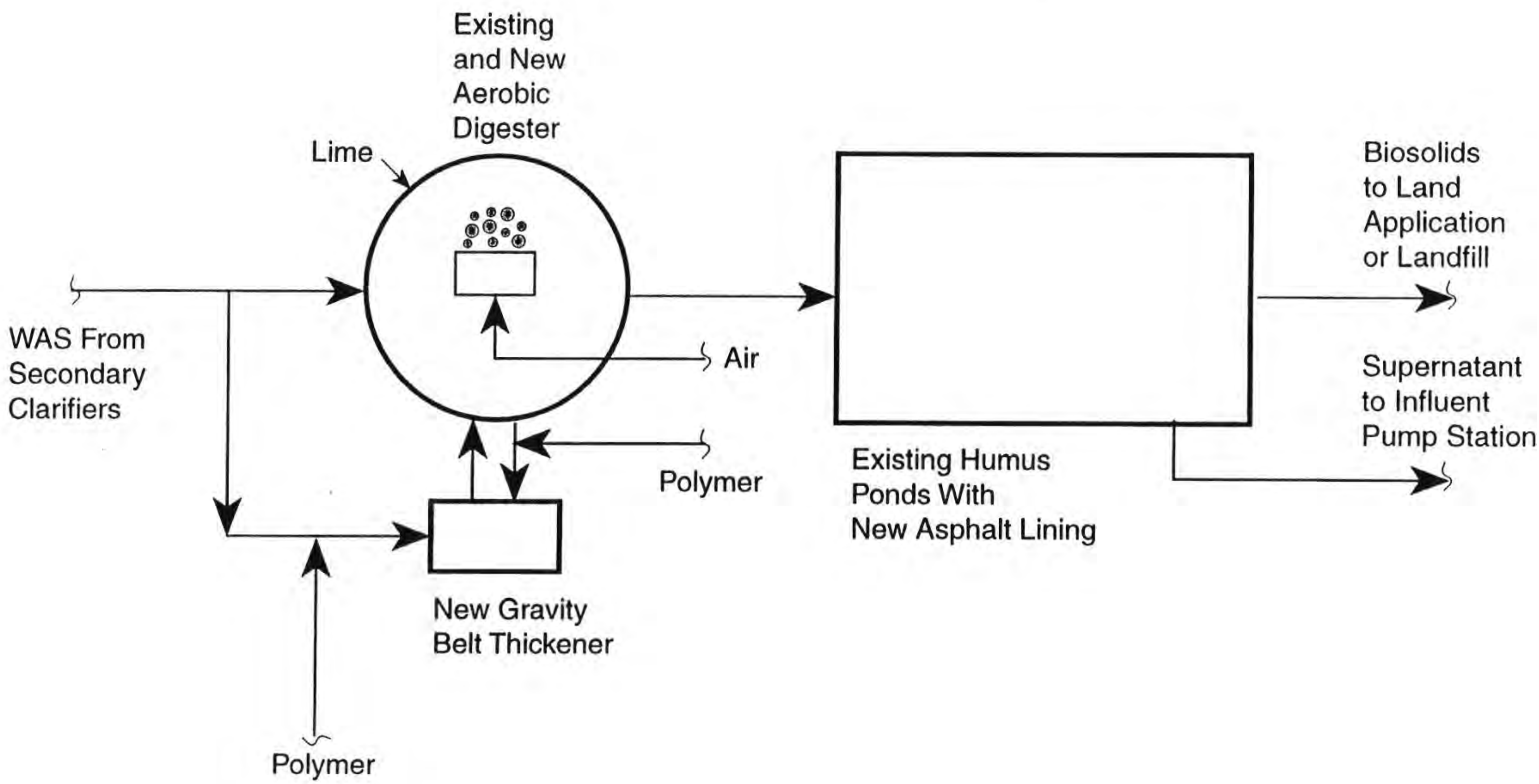

Figure 8-1
SLUDGE OPTION 1 FLOW SCHEMATIC

Table 8-1
Sludge Option 1 Design Information
Existing Facilities with Expanded Digestion, Thickening, and Humus Pond Modifications

Sludge Thickening	
Thickening method	Gravity belt thickener (GBT)
Number and size of units	1 @ 1 meter
GBT loading	400 lb/hr/meter
Design WAS quantity	2,362 lb/day
Polymer dose	8 lb/ton dried solids
Percent solids to digester	3 percent
Aerobic Digestion	
Type of digestion	Diffused air aeration in open basin
Existing volume	480,000 gallons
Additional volume required	480,000 gallons
SRT at design loading	101 days
Digester operating temperature	15°C
Lime dose for pH control	100 mg/L (as needed)
Sludge transfer pumps	Screw induced centrifugal
Number and size of pumps	3 @ 5 hp
Number and size of blowers	3 @ 75 hp
Recuperative thickening pump	Progressing cavity
Number and size of pumps	1 @ 3 hp
Wet Sludge Storage and Drying	
System type	Asphalt-lined humus ponds with continuous decanting
Number of ponds	2
Operating cycle	1 year
Drying time	3 months minimum
Percent dryness for dried solids	75 percent minimum
Total volatile solids destruction	80 percent
Operating depth	3 feet
Operating volume (per pond)	1,500,000 gallons

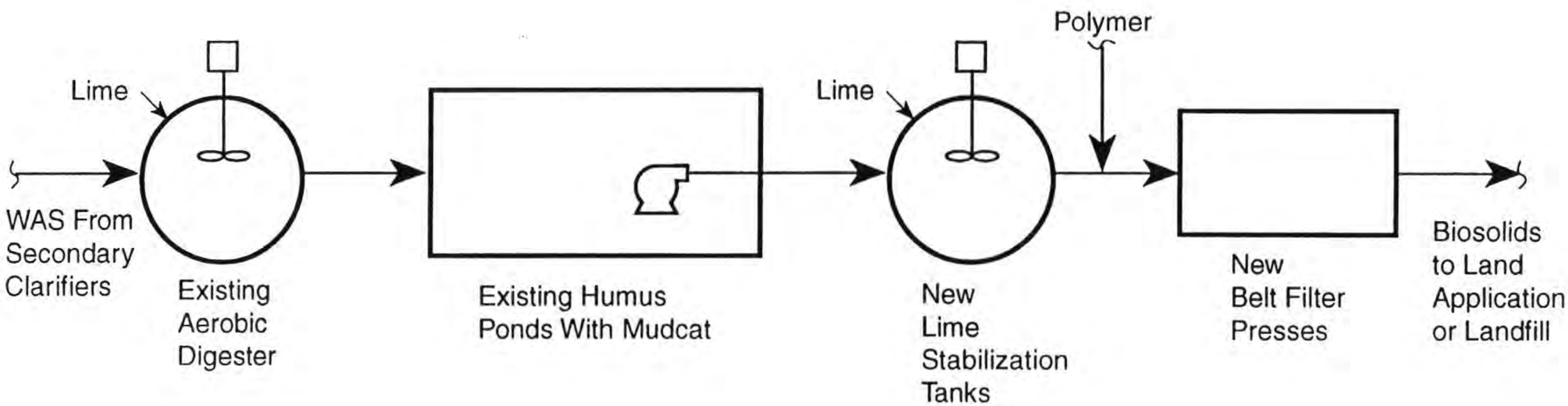

Figure 8-2
SLUDGE OPTION 2 FLOW SCHEMATIC

Table 8-2 Sludge Option 2 Design Information Existing Facilities with Mudcat, Lime Stabilization, and Dewatering	
Aerobic Digestion	
Type of digestion	Mechanical surface aeration in open basin
Existing volume	480,000 gallons
SRT at design loading	10.2 days
Sludge transfer pumps	Screw induced centrifugal
Number and size of pumps	2 @ 5 hp
Lime dose for pH control	100 mg/L (as needed)
Design WAS quantity	2,362 lb/day
Sludge Storage	
Sludge storage system	Humus ponds with continuous decanting
Number of ponds	2
Operating cycle	1 year
Operating depth (nominal)	3 feet
Operating volume (per pond)	1,500,000 gallons
Sludge removal system	Mudcat with cable guidance
Lime Stabilization	
Stabilization criteria	pH > 12.0 for 2 hours pH > 11.5 for 22 additional hours
Lime dose	0.3 lb lime as $Ca(OH)_2$ per lb dried solids
Lime usage	487 lb/day
Lime silo storage capacity	14 days
Lime mixing tanks	3 concrete tanks
Lime mixing	Coarse bubble diffusers
Sludge Dewatering	
Dewatering method	Belt filter presses (BFPs)
BFP loading	400 lb/hour/meter
Number of units	2 @ 1.5 meters
Polymer dose	14 lb/ton dried solids

Sufficient lime would be added to raise the pH of the lime/sludge mixture above 12.0 for a minimum of 2 hours and above 11.5 for an additional 22 hours to achieve pathogen and vector attraction reduction. Lime would be stored in a silo and fed to the tanks with feeding equipment.

To limit hauling costs, a dewatering facility would be constructed. Two belt filter presses would be housed in a building along with feed pumps, blowers for the lime stabilization tank aeration system, polymer feed equipment, and odor control equipment. For equipment sizing, land application disposal over a 3-month period is assumed. Thus, the entire year's sludge would be lime stabilized and disposed in 3 months. Operational flexibility would allow longer disposal periods if needed.

Option 3: New Digestion, Liquid Storage, and Dewatering

A flow schematic of Option 3 is shown in Figure 8-3. Design information is presented in Table 8-3. For this option, none of the existing sludge stabilization facilities would be used. New facilities would include a thickening and dewatering facility, aerobic digesters, and a liquid biosolids storage tank. High-temperature aerobic digestion [autothermal thermophilic aerobic digestion (ATAD)] would be used to achieve a 38 percent reduction in volatile solids for vector attraction reduction. The high operating temperatures of the ATAD reactors (60°C) provide pathogen reduction. Three ATAD reactors in series would be constructed. Sludge would be stored as a liquid in a covered biosolids storage tank.

Sludge would be thickened prior to digestion and dewatered prior to hauling for disposal. A gravity belt thickener would be used for thickening and two belt filter presses would be used for dewatering. Thickening and dewatering equipment would be housed in a building along with sludge transfer pumps, polymer feed equipment, and odor control equipment. As in Option 2, dewatering equipment is sized for a land application disposal period of 3 months.

Option 4: Existing Facilities with Sludge Dewatering and Year-Round Lime Stabilization

A flow schematic of Option 4 is shown in Figure 8-4. Design information is presented in Table 8-4. This option would utilize the existing aerobic digester as aerated sludge storage, and would retain the option of storing sludge in the humus ponds. New facilities would include a dewatering building that would house a belt filter press, a lime silo, polymer feed equipment, sludge belt conveyors, and a sludge loading and dewatered cake storage facility.

The aerobic digester would be operated as aerated storage, with no stabilization of sludge intended. Sludge from the aerated storage tank would be pumped to a single belt filter press for dewatering. Dewatered sludge would then be stabilized with lime. Sufficient lime would be added to raise the pH of the lime/sludge mixture above 12.0 for a minimum of 2 hours and above 11.5 for an additional 22 hours to achieve pathogen and vector attraction reduction.

Dewatering equipment, polymer mixing and feed equipment, sludge transfer pumps, lime silo and feed equipment, sludge conveying equipment, and a sludge loading facility would be housed in an odor controlled building.

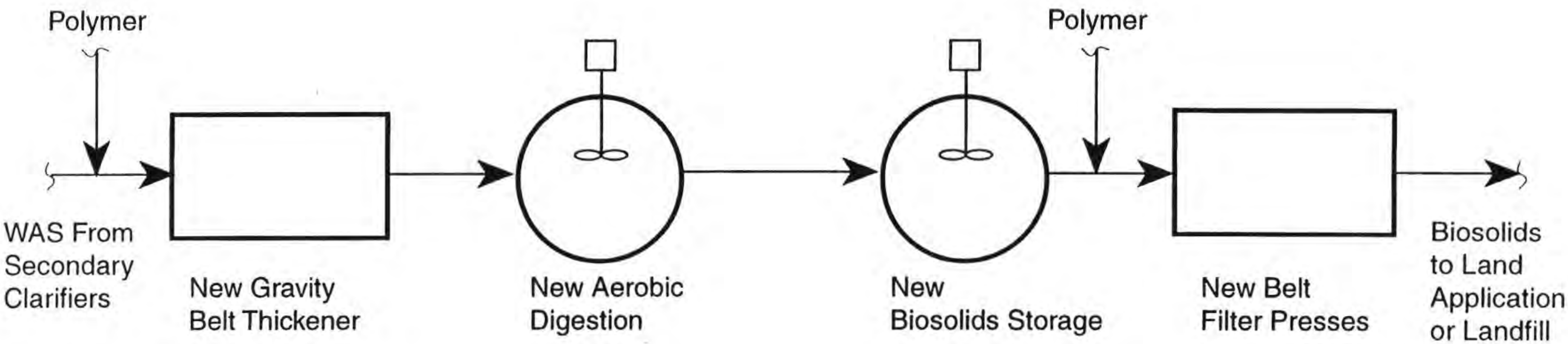

Figure 8-3
SLUDGE OPTION 3 FLOW SCHEMATIC

Table 8-3
Sludge Option 3 Design Information
New Digestion, Liquid Storage, and Dewatering

Sludge Thickening	
Thickening method	Gravity belt thickener (GBT)
Number and size of units	1 @ 1 meter
GBT loading	400 lb/hr/meter
Design WAS quantity	2,362 lb/day
Thickened sludge transfer pumps	Screw induced centrifugal
Number and size of pumps	2 @ 5 hp
Polymer dose	8 lb/ton dried solids
Digestion	
Type of digestion	Autothermal Thermophilic Aerobic Digestion (ATAD)
Volatile solids destruction	38 percent
Design SRT	8 days
Design temperature	60 degrees C
Number of ATAD reactors	3 in series
ATAD transfer pumps	Screw induced centrifugal
Number and size of pumps	2 @ 5 hp
Sludge Storage	
Sludge storage system	Liquid storage in covered tank
Storage duration	8 months
Storage volume	1,750,000 gallons
Tank diameter	130 feet
Tank height	20 feet
Biosolids transfer pumps	Screw induced centrifugal and progressing cavity
Number and size of pumps	2 @ 5 hp
Sludge Dewatering	
Method	Belt filter presses (BFPs)
Number and size of units	2 @ 1.5 meters
BFP loading	400 lb/hour/meter
Polymer dose	14 lb/ton dried solids

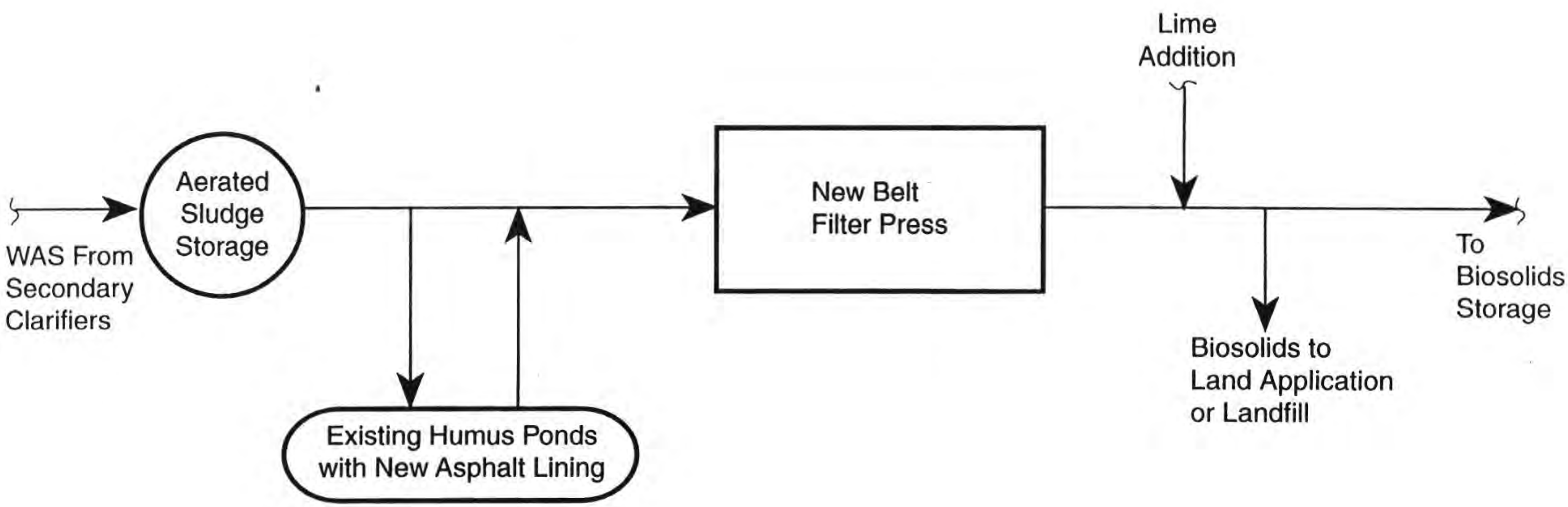

Figure 8-4
SLUDGE OPTION 4 FLOW SCHEMATIC

Table 8-4 Sludge Option 4 Design Information Existing Facilities with Sludge Dewatering and Year-round Lime Stabilization	
Aerated Sludge Storage	
Type	Mechanical surface aeration in open basin
Existing volume	480,000 gallons
Sludge Dewatering	
Type	Belt Filter Press (BFP)
Number and size of unit	1 @ 1.5 meters
Design WAS quantity	2,362 lb/day
BFP loading	400 lb/hour/meter
Polymer dose	14 lb/ton dry solids
Lime Stabilization	
Stabilization Criteria	pH>12 for 2 hours pH>11.5 for 22 additional hours
Lime Dose	0.15 lb lime as $Ca(OH)_2$ per lb dry solids
Lime usage	321 lbs/day
Lime silo storage capacity	50,000 lbs (one truck load)
Lime supply available	156 day maximum
Lime mixing	Double screw conveyor
Additional Sludge Storage	
Sludge Storage System	Humus ponds
Number of ponds	2
Operating depth	3 feet
Storage capacity (per pond)	1,500,000 gallons

In the case where dewatering equipment is inoperable, or landfill/land application is not possible, the aerated sludge may be sent to the existing humus ponds for storage and eventual drying in summer. Sludge removal would occur after drying for a minimum of 3 months for pathogen reduction and 75 percent dryness for vector attraction reduction. A new asphalt liner would be provided for the existing ponds.

Land Application Disposal

Two options exist for sludge disposal: landfill disposal and land application disposal (beneficial reuse). This section examines the land application option and determines the land requirement based on the existing regulations. In addition, application methods for the sludge, depending on the sludge treatment options, are discussed.

Biosolids Quantity and Quality

Tables 8-5 and 8-6 summarize the quantity and quality of the biosolids produced from the Dallas WWTF. The quality data is the average of the data gathered from 1989 through 1995. (see Table 2-6 for detailed biosolids data). The quantity produced is based on projected WWTF flows for 2020 and the four options of solids treatment selected for detailed analysis.

Table 8-5
Biosolids Quantity

	2020 Biosolids Production			
	Option 1 Humus Mods	Option 2 Mudcat	Option 3 ATAD	Option 4 Year-Round Lime
Total Solids (lb/day)	1,181	1,746	1,801	2,221
Volume Produced (gallons/day)	380	1,139	1,780	1,780
Percent Solids (%) as disposed	75	25	16	17
Dissolved Lime Dose [lb as $Ca(OH)_2$ per lb solids]	--	0.3	--	0.15

Land Area Requirement

Land application at agronomic rates is generally based on limiting the amount of nitrogen applied through the biosolids to a value that does not exceed the selected crop's uptake capacity. The crop assumed for this analysis was pasture grass. The nutrient uptake rates for pasture grass vary depending on the type of harvest (conventional equipment or grazing), and amount of irrigation. The analysis for determining land area required was performed for three different uptake rates of nitrogen, phosphorus, and potassium. Below are the different uptake rates used in the analysis:

Table 8-6 Biosolids Quality	
Parameters	**Average**
Nutrients	
Total Kjeldahl Nitrogen (% dry weight)	2.1
Nitrate (% dry weight)	0.008
Ammonia (% dry weight)	0.37
Phosphorus (% dry weight)	0.90
Potassium (% dry weight)	0.19
Metals	
Arsenic (mg/kg)	3.0
Mercury (mg/kg)	<0.5
Molybdenum (mg/kg)	<1.0
Selenium (mg/kg)	19
Cadmium (mg/kg)	4.3
Chromium (mg/kg)	54
Copper (mg/kg)	1,603
Lead (mg/kg)	99
Nickel (mg/kg)	91
Zinc (mg/kg)	394

- Nitrogen 215 lbs/acre, 120 lbs/acre, and 40 lbs/acre
- Phosphorus 272 lbs/acre, 152 lbs/acre, and 51 lbs/acre
- Potassium 57 lbs/acre, 32 lbs/acre, and 11 lbs/acre

The assumptions/recovery factors used to determine the available nitrogen are:

- 30 percent of the organic nitrogen
- 50 percent of the ammonia nitrogen
- 100 percent of the nitrate-nitrite nitrogen

Based on the projected production, available nutrient data, and recommended uptake rates for pasture grass, the land area required to beneficially reuse the biosolids was determined. Table 8-7 summarizes the agronomic loading rate based on available nitrogen, lbs/acre/year of nutrients applied, and land area required.

Depending on the treatment option selected and the nitrogen requirement for the desired pasture grass, the land area required ranges from 14 to 139 acres. Actual land requirements may also vary slightly depending on operation of the selected solids treatment option (nitrogen removal from system). From the initial review of the available land surrounding the WWTF, there appears to be plenty of land for land applying the biosolids generated from the WWTF. It still needs to be determined which farmers are most interested in receiving the biosolids from the WWTF, and the appropriate time of year during which the biosolids would be applied.

Metals Loading Rate and Site Life Analysis

Based on the quality data and annual biosolids production, the yearly metals loading rates for arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, and zinc were calculated. By comparing the annual metals loading rate with the allowed

Table 8-7 Land Area Required				
	Treatment Options			
	Option 1	Option 2	Option 3	Option 4
- Nitrogen Requirement = 215 lbs/acre				
2020 Biosolids Production (dry tons/yr)	216	319	329	405
Available Nutrients				
Available Nitrogen (lbs/ton)	14.2	13.2	14.2	13.7
Phosphorus (lbs/ton)	18.0	16.7	18.0	17.3
Potassium (lbs/ton)	3.8	3.5	3.8	3.7
Agronomic Loading Rate (tons/acre)	15.10	16.23	15.10	15.66
Applied Nutrients				
Available Nitrogen (lbs/ac/yr)	215	215	215	215
Phosphorus (lbs/ac/yr)	272	272	272	272
Potassium (lbs/ac/yr)	57	57	57	57
Land Area Required (acres)	14.3	19.6	21.8	25.9
Nitrogen Requirement = 120 lbs/acre				
2020 Biosolids Production (dry tons/yr)	216	319	329	405
Available Nutrients				
Available Nitrogen (lbs/ton)	14.2	13.2	14.2	13.7
Phosphorus (lbs/ton)	18.0	16.7	18.0	17.3
Potassium (lbs/ton)	3.8	3.5	3.8	3.7
Agronomic Loading Rate (tons/acre)	8.43	9.06	8.43	8.74
Applied Nutrients				
Available Nitrogen (lbs/ac/yr)	120	120	120	120
Phosphorus (lbs/ac/yr)	152	152	152	152
Potassium (lbs/ac/yr)	32	32	32	32
Land Area Required (acres)	25.6	35.2	39.0	46.4
Nitrogen Requirement = 40 lbs/acre				
2020 Biosolids Production (dry tons/yr)	216	319	329	405
Available Nutrients				
Available Nitrogen (lbs/ton)	14.2	13.2	14.2	13.7
Phosphorus (lbs/ton)	18.0	16.7	18.0	17.3
Potassium (lbs/ton)	3.8	3.5	3.8	3.7
Agronomic Loading Rate (tons/acre)	2.81	3.02	2.81	2.91
Applied Nutrients				
Available Nitrogen (lbs/ac/yr)	40	40	40	40
Phosphorus (lbs/ac/yr)	51	51	51	51
Potassium (lbs/ac/yr)	11	11	11	11
Land Area Required (acres)	76.7	105.5	117.0	139.1

cumulative loading limits established by EPA and the State of Oregon, the projected site life for the land application of the biosolids was estimated. With the agronomic loading rates of 15.10, 8.43, and 2.81 tons/acre, the site life was estimated to be 28, 50, and 149 years, respectively. The limiting metal in the site life analysis was copper. With industrial flows to the WWTF separated to an alternate treatment system, as discussed in Chapter 7, the copper content of the sludge will decrease and the site life will increase. Table 8-8 summarizes the annual loading rate and the projected site life analysis.

Biosolids Application

Biosolids can be applied through several methods, ranging from sprinkler irrigation systems to surface spreading, depending on the percent solids. Because of the proximity of the available agricultural land to the WWTF, surface application using a tank trailer for liquid biosolids and/or a manure spreader for dewatered biosolids could be used. Biosolids would typically be applied soon after harvest while the grass is short, to minimize damage to the crop from application vehicles and to allow for the harvest-restricted period following the biosolids application. An actual schedule for application to particular fields would need to be determined before startup, and should be flexible enough to accommodate unpredictable occurrences such as weather, flood plain conditions, and harvesting operations.

Cost Evaluation

The capital cost estimates for the four sludge stabilization options are summarized in Table 8-9. Capital costs consist of construction costs for stabilization, dewatering, and storage facilities, as well as sludge application implements. Capital costs for a future third humus pond are also included for Option 1. O&M cost estimates for the four options are shown in Table 8-10. O&M costs consist of labor, power, chemical, maintenance, and hauling costs. Labor costs are calculated based on operator classification as required by the complexity of each option. Power cost is assumed to be $0.05/kWh. Chemical costs are based on average annual consumption, and maintenance costs are assumed to be 1 percent of the capital cost for each option. Sludge hauling costs for all options are based on hauling to Coffin Butte Landfill.

The results of a present worth analysis for the three sludge stabilization options are presented in Table 8-11. An interest rate of 8.875 percent was assumed with a project life of 25 years (1995 through 2020). Salvage values are calculated as in Chapter 7. Option 4 had the lowest capital and overall costs, and would require the least amount of new facilities. Option 1 also had the lowest annual O&M costs.

Noncost Evaluation

A noncost evaluation of the four screened alternatives is discussed below and summarized in Table 8-12. Noncost impacts due to expansion of the existing WWTF site are discussed in Chapter 7.

Option 4 ranks the highest on ease of implementation and energy use since fewer new facilities would be required. All options score high on performance reliability and flexibility

Table 8-8 Metals Loading Rate and Site Life					
	Metal Content (lbs/ton)	Annual Loading Rate (lbs/ac/yr)	Allowable Annual Loading Rate—503 Regulations (lbs/ac/yr)	Cumulative Loading Limits—503 Regulations (lbs/ac)	Site Life (yrs)
Agronomic Loading Rate = 15.10 tons/acre					
Arsenic	0.006	0.09	1.78	36.6	404
Cadmium	0.0086	0.13	1.69	34.8	268
Chromium	0.108	1.63	133.80	2,676	1,641
Copper	3.206	48.41	66.90	1,338	28
Lead	0.198	2.99	13.40	267.6	90
Mercury	0.001	0.02	0.76	15.2	1,007
Molybdenum	0.002	0.03	0.80	16.1	533
Nickel	0.182	2.75	18.73	374.65	136
Selenium	0.038	0.57	4.46	89.2	155
Zinc	0.788	11.90	124.88	2,497.6	210
Agronomic Loading Rate = 8.43 tons/acre					
Arsenic	0.006	0.05	1.78	36.6	724
Cadmium	0.0086	0.07	1.69	34.8	480
Chromium	0.108	0.91	133.80	2,676	2,940
Copper	3.206	27.02	66.90	1,338	50
Lead	0.198	1.67	13.40	267.6	160
Mercury	0.001	0.01	0.76	15.2	1,804
Molybdenum	0.002	0.02	0.80	16.1	955
Nickel	0.182	1.53	18.73	374.65	244
Selenium	0.038	0.32	4.46	89.2	279
Zinc	0.788	6.64	124.88	2,497.6	376
Agronomic Loading Rate = 2.81 tons/acre					
Arsenic	0.006	0.02	1.78	36.6	2,172
Cadmium	0.0086	0.02	1.69	34.8	1,441
Chromium	0.108	0.30	133.80	2,676	8,821
Copper	3.206	9.01	66.90	1,338	149
Lead	0.198	0.56	13.40	267.6	481
Mercury	0.001	0.00	0.76	15.2	5,411
Molybdenum	0.002	0.01	0.80	16.1	2,866
Nickel	0.182	0.51	18.73	374.65	733
Selenium	0.038	0.11	4.46	89.2	836
Zinc	0.788	2.21	124.88	2,497.6	1,128

Table 8-9 System Option Capital Cost Estimate Summary				
	Sludge Treatment and Disposal Capital Costs (1993 $, Millions)			
Item	**Option 1 Humus Mods**	**Option 2 Mudcat**	**Option 3 ATAD**	**Option 4 Year-Round Lime**
Stabilization	1.2	0.8	0.9	0.5
Thickening/ Dewatering	0.6	1.6	1.9	0.6
Storage	1.5	1.0	1.8	0.8
Application Implements	0.3	0.3	0.3	0.3
Total Capital Cost	3.6	3.7	4.9	2.2

Table 8-10 System Option O&M Cost Estimate Summary				
	Sludge Treatment and Disposal O&M Costs (1995 $, Millions Per Year)			
Item	**Option 1 Humus Mods**	**Option 2 Mudcat**	**Option 3 ATAD**	**Option 4 Year-Round Lime**
Labor	0.05	0.07	0.10	0.07
Power	0.05	0.03	0.04	0.02
Chemicals	0.01	0.03	0.01	0.03
Maintenance	0.04	0.04	0.05	0.02
Sludge Hauling	0.01	0.02	0.02	0.02
Total O&M Costs	0.16	0.19	0.22	0.16

Table 8-11 Relative Present Worth Cost Estimate Summary				
	Sludge Disposal and Treatment Costs (1995 $, Millions)			
Item	**Option 1 Humus Mods**	**Option 2 Mudcat**	**Option 3 ATAD**	**Option 4 Year-Round Lime**
Capital Cost	3.6	3.7	4.9	2.2
Present Worth of O&M	1.5	1.8	2.2	1.6
Present Worth Costs	5.1	5.5	7.1	3.8
Present Worth of Salvage Value	0.1	0.1	0.1	0.0
Total Net Present Worth Costs	5.0	5.4	7.0	3.8

as all four will meet new sludge regulations and all four will provide for both landfill and land application disposal. Option 3 scores highest for land use compatibility and visual, noise, and odor impacts because of the elimination of the humus ponds. Recreational impacts should be minimal for all options. Option 1 scores low on habitat, floodplains, and cultural and historical resources due to the construction of the most new facilities in terms of land area. Option 4 had the highest noncost score as defined in Table 8-12.

A summary of noncost issues associated with sludge disposal is presented below. All four sludge stabilization options include facilities to allow sludge disposal to either landfill or land application sites.

Existing and Planned Land Uses

Onsite and Adjacent Uses

Landfill Disposal. Up to 3,217 cubic yards of sludge would be disposed of in the Coffin Butte Landfill. The landfill operations would be expected to accommodate a portion of the material as a soil amendment to cap closed portions of the facility. However, depending on future needs of the landfill, some of the material may have to be disposed of within landfill cells. The additional fill would not be expected to appreciably decrease the lifespan of the landfill. Landfilling may involve disposal charges (tipping fees) to the City of Dallas.

Land Application Disposal. Adverse short-term or long-term effects to the overall land use pattern of the project area are not expected. Potential localized adverse effects might include:

- Very minor long-term impacts to traffic patterns resulting from transporting sludge in trucks.
- Long-term suitability of properties adjacent to the application sites for other permitted uses (such as farm-related residences that might be affected by odors emitting from the sites).

Applying sludge to cropland might increase crop yield because of increased nutrient budgets achieved through land application. Lime can be beneficial to acidic soils by raising pH.

Recreational Uses

Landfill Disposal. No impacts are expected to recreational uses under this alternative.

Land Application Disposal. Adverse effects on recreational activities are expected to occur only if land application sites are located near recreational facilities. Impacts of odor from applying sludge to properties adjacent to recreational sites would be temporary and would not be expected to result in substantial impacts to adjacent recreational activities.

Natural Habitat

Landfill Disposal

Impacts to natural habitats are expected to be limited to those that are already approved and planned to occur at the landfill site.

Table 8-12
System Option Noncost Impact Summary

Impact Criteria	System Option Impact: Option 1 Humus Mods	Option 2 Mudcat	Option 3 ATAD	Option 4 Year-round Lime
Ease of implementation	0	-	-	+
O & M characteristics	0	-	-	0
Performance reliability	+	+	+	+
Flexibility	+	+	+	+
Energy use	0	-	-	+
Future regulatory compliance	0	0	0	0
Land use compatibility	-	-	+	0
Recreational impacts	0	0	0	0
Natural habitat	-	-	-	-
Wetlands	0	0	0	0
Floodplains	-	0	0	0
Cultural and historical resources	-	0	0	0
Visual, noise, and odor impacts	-	-	+	0
Overall system option impact	-3	-4	0	+3

Key:
+ Positive impact
0 No impact
- Negative impact

Overall system option impact = Number of positive impacts - Number of negative impacts

Land Application Disposal

Application of sludge to open agricultural properties could adversely affect sensitive species and their habitats. However, reconnaissance surveys conducted for the proposed project indicate a very low potential for occurrence of sensitive species or their habitats at the proposed disposal sites.

Wetlands

Landfill Disposal

Impacts to wetlands are expected to be limited to those that are already approved and planned to occur at the landfill site.

Land Application Disposal

Application of sludge to "jurisdictional" wetlands on agricultural lands may require discharge and/or fill permits from appropriate agencies. Surveys would have to be conducted to identify "jurisdictional" wetlands on potential land application sites.

Floodplains

Landfill Disposal

This alternative is not expected to affect floodplains or floodways.

Land Application Disposal

Sludge application to agricultural lands within floodplains is not planned. Consequently, this alternative is not expected to affect floodplains or floodways.

Cultural and Historical Resources

Landfill Disposal

Impacts to cultural or historical resources are expected to be limited to those that might occur from planned and approved expansions of the landfill.

Land Application Disposal

Historical resources are not expected to be affected by applying sludge to agricultural fields. Changes to soil chemistry could adversely affect archaeological resources contained in land application properties. An archaeological survey may be required to identify potential cultural resource site locations.

Visual, Noise, and Odor

Landfill Disposal

Impacts to viewsheds, noise levels, and odors surrounding the landfill are expected to be limited to those that might occur from planned and approved expansion of the landfill.

Land Application Disposal

This alternative is not expected to result in impacts to viewsheds. Noise levels along haul routes for sludge application trucks may be slightly affected by their periodic passing. The effects are not expected to be substantial.

Applying sludge to agricultural fields may cause odors in the immediate vicinity of the applications. The effects are not expected to be substantial if densely developed areas are avoided as application sites.

System Option Selection

Option 4, Existing Facilities with Sludge Dewatering and Year-round Lime Stabilization, has both the lowest present worth cost and the highest noncost evaluation score. Therefore, Option 4 is the recommended option for the WWTF.

Chapter 9
Wastewater Management Program Optimization and Summary

CHAPTER 9

WASTEWATER MANAGEMENT PROGRAM OPTIMIZATION AND SUMMARY

It was determined in Chapter 7 that System Option 2, Rickreall Creek discharge with summer irrigation and separate irrigation disposal of metal-bearing industrial wastes, is the optimum system option for Dallas based on cost and non-cost criteria. Comparison of system options was based on providing a sufficient level of treatment in each case to meet the effluent quality requirements of the disposal component of the system option. The effluent quality for each option was estimated using available plant data and current understanding of the performance of various treatment and disposal components within the option. Very limited baseline data and performance information are available for modeling and predicting the fate of some effluent quality parameters, particularly metals, through the treatment processes. Performance can be case-specific and affected by unique, complex interactions between metals and other parameters. Limited data are available for domestic wastewater background metals concentrations, which control the plant effluent quality when separate treatment is provided for the industrial waste. The design criteria were based on best available data. This is a limitation in accurately defining options that include discharge to Rickreall Creek, because compliance with effluent metals limits is critical for these options.

The selected Rickreall Discharge with Summer Irrigation Option presents opportunities for optimization in two ways. One is to optimize the relative scope of the treatment and disposal components. A higher level of treatment means that the effluent can be discharged to Rickreall Creek for more months of the year and irrigated for fewer months. A higher treatment cost thus results in a lower disposal cost, and vice versa. This chapter examines the various levels of treatment achievable with various current technologies, the impact of each on the discharge versus irrigation periods, and the cost and non-cost issues associated with each. Four sub-options of the selected Option 2 from Chapter 7 (numbered 2a, 2b, 2c, and 2d) are discussed and evaluated. The other optimization opportunity lies in the possibility of establishing more reliable design criteria by obtaining more baseline data and better performance information, possibly through a targeted testing program. This can help provide a more efficient and cost-effective design. The sub-option selected from among 2a, 2b, 2c, and 2d will be further examined for such optimization.

Based on the results of this evaluation, the overall recommended improvement plan for the Dallas WWTF is described. This chapter also presents the plan cost estimates, discusses the environmental impacts and mitigation measures, and proposes an implementation schedule and financial plan.

The sections of this chapter are organized as follows:

I. Rickreall Creek discharge with summer irrigation option optimization

  A. Description of sub-options 2a through 2d: Treatment components

  B. Sub-option effluent quality and Rickreall Creek discharge considerations

- C. Irrigation requirement descriptions for sub-options 2a through 2d
- D. Cost evaluation
- E. Verification of critical design data/assumptions
- F. Optimization recommendations

II. Facility Plan Summary

- A. Collection system improvements
- B. Liquid treatment and disposal
- C. Biosolids stabilization and disposal

III. Wastewater Management Program Cost Estimates

- A. Capital costs
- B. O&M costs

IV. Environmental Impacts and Mitigation

V. Implementation Considerations

VI. Financial Considerations

Rickreall Creek Discharge with Summer Irrigation Option Optimization

Table 9-1 summarizes the four sub-options considered for overall optimization of the treatment and disposal components of System Option 2 described in Chapter 7. Presence or absence of various components is indicated in the table along with some explanatory notes. The influent pumping, screening, secondary clarification, disinfection, post-aeration, and separate industrial waste irrigation components for all sub-options are identical to corresponding Option 2 components described in Chapter 7. Other components of the sub-options 2a through 2d are described below in more detail. For Sub-option 2d, a new wetlands treatment component is evaluated as an effluent polishing step.

Treatment Components

Aeration

Sub-options 2a, 2b, and 2c would require new plug flow aeration basins, while rehabilitation of the existing basins with construction of a new anoxic selector would be adequate for Sub-option 2d. Aeration basin design for sub-options 2a, 2b, and 2c is identical to that described for Option 2 in Chapter 7. Nitrification-denitrification and supplemental alkalinity would be provided for all sub-options except 2d, where the wetlands polishing step would provide ammonia removal. Aeration design information for sub-option 2d is summarized in Table 9-2.

Advanced Chemical Treatment

Tertiary chemical addition and tertiary clarification are provided only for Sub-option 2c, and are as described for Option 4 in Chapter 7.

Filtration

Moving bed filters are provided for Sub-options 2b and 2c as described for Option 2 in Chapter 7.

Wetlands

Wetlands are incorporated into Sub-option 2d only, as a multi-purpose effluent polishing alternative to advanced biological and/or chemical treatment. Intermediate pumping will be required at the existing plant site for this sub-option to convey effluent offsite to the final wetlands treatment step. Intermediate pumping design information is included in Table 9-2. A brief description of the wetlands system proposed is presented below.

Table 9-1
Liquid System Sub-options for Optimization of Rickreall Creek Discharge/Summer Irrigation

	System Sub-option			
Component	**(2a) Advanced Biological without Filtration**	**(2b) Advanced Biological with Filtration**	**(2c) Advanced Biological and Chemical with Filtration**	**(2d) Conventional Biological with Wetlands**
Treatment				
Aeration	Advanced (nitrification/ denitrification)	Advanced (nitrification/ denitrification)	Advanced with biological nutrient removal	Conventional (no nitrification/ denitrification)
	New plug flow basins			Existing basins, rehabilitated, with new selector
Alkalinity adjustment	Soda ash	Soda ash	Soda ash	None
Secondary clarification	Circular, center feed			
Wetlands	None	None	None	Present
Tertiary chemical addition	None	None	Lime	None
Tertiary clarification	None	None	Flocculator clarifier	None
Filtration	None	Moving bed	Moving bed	None
Disinfection	Sodium hypochlorite			
Dechlorination	Sodium bisulfite			None
Post-aeration	Surface mechanical aerators			
Storage and Disposal				
Intermediate pumping	None			Present
Domestic effluent storage	None			
Domestic effluent pumping and distribution	New	New	None	New
Domestic effluent irrigation, poplar trees	Poplar trees	Poplar trees	None	Poplar trees
Outfall	New			
Industrial effluent pumping, storage, and distribution	New			
Separate industrial irrigation	Poplar trees			

Table 9-2
Sub-option 2d: Existing Aeration Basins Rehabilitation and Anoxic Selector Design Information

Item	Description
Anoxic Selector	
Volume	0.175 mg
Length	70 feet
Width	20 feet
Sidewater depth	16.75 feet
Anoxic Mixers	
Type	Submersible
Number of units	3
Horsepower, each	7.5
Existing Basin Rehabilitation	
Basin grit accumulation	Remove 2-foot layer, dispose
Liner	Repair, clay, 6 inches minimum
Basin slope shotcrete	Replace
Railing	Replace
New Mechanical Aerators	
Type	Floating turbine
Number of units	8
Horsepower, each	25
Intermediate Pumps	
Type	Vertical turbine
Total capacity (mgd)	16.1
TDH (feet)	20
Number of units	
2.3 mgd/15 hp	
Constant speed	None
Adjustable speed	1
5.8 mgd/50 hp	
Constant speed	2
Adjustable speed	1
Intermediate pump wet well dimensions (feet)	15 dia. x 20 deep

Objectives

The objectives of the wetland treatment system (WTS) are to provide the following:

- Advanced treatment of wastewater following conventional treatment, particularly with regards to removal of phosphorus (P) and ammonia-nitrogen (NH_4-N)
- A buffer for the wastewater treatment plant and storage reservoir
- A viable reuse option
- Creation of wildlife habitat
- The opportunity for educational and passive recreation benefits
- A "green" treatment alternative

WTS Technology and Processes

Wetland systems, both natural and constructed, have demonstrated water quality treatment for more than 50 years. There are currently over 200 systems operating within the United States, with additional hundreds operating in Canada, Europe, Asia, and Africa. Most systems are one of three types or a combination of these types: surface flow, subsurface flow (or gravel bed), and floating macrophyte (e.g. duckweed, water hyacinth). Subsurface flow systems, because of their hydraulic complexity, are generally appropriate only for treatment of volumes less than 0.5 mgd. Floating macrophyte systems function at the greatest efficiency during the growing season and so are most appropriate where the growing season is year-round or in situations where non-growing season treatment is not necessary. The recommended system type for the City of Dallas is therefore a surface flow system, with predominantly emergent vegetation (e.g. cattails).

Unlike a natural wetland system in which hydrology is largely fixed by the tolerance limits of the existing plant community, a constructed wetland is designed to regulate water depth and residence time, two of the most important factors in wetland treatment design. Also, the design of constructed wetland systems features parallel cells and cells in series. Constructed wetlands have relatively low construction, operation, and maintenance costs compared with conventional advanced treatment technologies.

Constructed emergent wetlands are not typically harvested to remove nutrients. Rather, the microbial flora (bacteria and fungi) that attach to the plants have the natural assimilatory capacity to remove biodegradable organics and nitrogen (ammonia and nitrate) efficiently and reliably. Metals and phosphorus can be sequestered in plant materials and wetland sediments.

Description of Alternative: Conceptual Design

In order to accomplish the above objectives, the WTS for the City of Dallas would cover approximately 380 acres of wetted area, with an additional 95 acres in berms, buffers, and access roads. This acreage would be sectioned into 8 cells of approximately 48 acres each, in two parallel series to allow for maintenance and improve flow distribution and control. The downstream cells would be somewhat irregular in shape, as each subsequent cell in the sequence is designed to promote a higher frequency and diversity of wildlife use and human access. Buffers would be planted with native trees.

The water depth in the wetlands would average approximately 2 feet, with deep water areas (to 8 feet) located transverse to the flowpath to allow even distribution of flow. The area of deeper water would increase in the final cells, for temperature control. Inflow structures could be gated pipes into the initial cells and culverts into subsequent cells, or culverts into all cells. Discharge structures would be adjustable weirs, into culverts between cells.

Vegetation cover would be approximately 75 percent in cells early in the flowpath, with cover in downstream cells approaching 50 percent. The final cells would have nearly 100 percent cover, except for the deep water areas. Cattails (*Typha* spp.) and bulrush (*Scirpus* spp.) would dominate plant communities in the initial cells, and more diverse communities of plants tolerant of shallower water depths that provide more wildlife benefits would be found in the downstream cells.

Because site soil conditions are unknown, it is assumed that the site will need to have a synthetic liner installed. If soils are predominantly clay and the water table is sufficiently low, the existing soils may be augmented as necessary and compacted in place to create a liner, which would be significantly less expensive.

Design Criteria

Design criteria are summarized in Table 9-3. WTS treatment efficiency for all parameters except metals was estimated using standard models (Kadlec and Knight, 1995). Note that total phosphorus removal rates under winter loads and conditions set the WTS area. Metal removal efficiencies were estimated based on removal rates documented in the literature for treatment of stormwater runoff and mine drainage in wetlands, and from first-hand knowledge of other wastewater treatment wetland sites. Copper, iron, lead, and zinc are expected to show 60 percent removal, while the remaining metals (except for sodium) are expected to show 40 percent removal. Sodium is unlikely to be removed in the WTS.

Dechlorination

Sodium bisulfite dechlorination is provided for all sub-options except 2d, where the wetlands provide this function.

Sub-Option Effluent Quality and Rickreall Discharge Considerations

The treatment technologies used in the four sub-options discussed in this chapter were evaluated in Chapter 4 in the context of effluent quality achievable with various levels of treatment, and the impact of effluent quality on allowable duration of discharge to Rickreall Creek. Several assumptions regarding baseline metals concentrations and removal percentages were inherent in predicting the achievable effluent quality. The allowable discharge durations based on copper toxicity for various levels of treatment are summarized in Figure 4-3. The levels of treatment represented by alternatives 1 through 4 in this figure correspond, respectively, to sub-options 2a through 2d. Each shaded cell in the figure indicates that discharge to Rickreall Creek may exceed water quality criteria for the month and alternative corresponding to that cell based on influent metal concentration, and removal performance assumptions mentioned earlier. For the present analysis, it is assumed that plant effluent will be diverted to irrigation when discharge to the creek may exceed water quality criteria. The remaining allowable discharge duration forms the basis of reclaimed water flow estimates (Table 9-4) and the related water balance analysis, which is used to size components of the effluent irrigation system for each of the sub-options.

Table 9-3 Wetland Treatment System Design Criteria	
Design Flows: Summer	3.24 mgd (4.48 x 10^6 m^3/yr)
Winter	8.21 mgd (1.13 x 10^7 m^3/yr)
Summer Temperature (°C; average July)	15.6
Winter Temperature (°C; average January)	7.2
Wetted Area	380 acres
Berm, Buffer, and Access Roads	95 acres
Total Acreage	475 acres
Cell Size	48 acres
Number of Cells	8
Number of Treatment Trains	2
Water Quality: Summer	
TSS in (mg/L)	10
TSS out (mg/L)	5.0
BOD in (mg/L)	10
BOD out (mg/L)	5.8
TKN in (mg/L)	7
TKN out (mg/L)	1.5
TP in (mg/L)	5
TP out (mg/L)	0.1
Water Quality: Winter	
TSS in (mg/L)	20
TSS out (mg/L)	5.0
BOD in (mg/L)	20
BOD out (mg/L)	6
TKN in (mg/L)	15
TKN out (mg/L)	5.4
TP in (mg/L)	2.5
TP out (mg/L)	0.5

Sub-Option Effluent Irrigation Requirements

Water Balance and Storage Analysis

Available Reclaimed Water. Table 9-4 summarizes the estimated monthly reclaimed water flows for the year 2020 and the available reclaimed water for the various sub-options considered.

Irrigation Demand. In accordance with procedures described in Chapter 7, the resulting monthly consumptive use, net irrigation requirements, and gross irrigation required for the poplar trees used in the water balance analysis are listed in Table 9-5.

Results of the Water Balance. Table 9-6 summarizes the water balance analysis results. Detailed results of the water balance analyses are in Appendix D.

Plantation and Surface Area

Poplar would be planted in lines 10 feet apart, separated by 2 feet along the lines, for a tree population density of about 2,200 plants per acre. The density described was included in a series of water balance analyses that indicate the appropriate size of the site.

Table 9-4 Estimated Reclaimed Water Flows, mgd										
	Design Year 2020									
Month	Average Monthly WWTF Flow, mgd	Option 2a Summer Irrigation During May through November		Option 2b Summer Irrigation During July through October		Option 2c Summer Irrigation Industrial Flow Only		Option 2d Summer Irrigation June through October		
		WWTF Effluent	Industrial Effluent	WWTF Effluent	Industrial Effluent	WWTF Effluent	Industrial Effluent	WWTF Effluent	Industrial Effluent	
January	5.78	0	0.2	0	0.2	0	0.2	0	0.2	
February	6.19	0	0.2	0	0.2	0	0.2	0	0.2	
March	5.03	0	0.2	0	0.2	0	0.2	0	0.2	
April	3.82	0	0.2	0	0.2	0	0.2	0	0.2	
May	2.94	2.94	0.2	0	0.2	0	0.2	0	0.2	
June	2.53	2.53	0.2	0	0.2	0	0.2	2.53	0.2	
July	2.17	2.17	0.2	2.17	0.2	0	0.2	2.17	0.2	
August	2.21	2.21	0.2	2.21	0.2	0	0.2	2.21	0.2	
September	1.96	1.96	0.2	1.96	0.2	0	0.2	1.96	0.2	
October	2.15	2.15	0.2	2.15	0.2	0	0.2	2.15	0.2	
November	3.4	3.4	0.2	0	0.2	0	0.2	0	0.2	
December	5.07	0	0.2	0	0.2	0	0.2	0	0.2	
Volume/Yr										
MG	1,316	530.27	73.2	261.36	73.2	0	73.2	337.13	73.2	
AC-FT	4,038	1,627.1	224.6	802	224.6	0	224.6	1,034.5	224.6	

Table 9-5 Poplar Tree Gross Irrigation Requirements			
	2,200 trees per acre; 3-year-old trees (inches)		
Month	Consumptive Use	Net Irrigation Required	Gross Irrigation Required
January	0	0	0
February	0	0	0
March	2.67	0.13	0.16
April	4.99	2.78	3.48
May	7.59	6.34	7.92
June	9.61	9.38	11.72
July	12.04	12.72	15.0
August	9.9	10.57	13.21
September	7.11	7.16	8.95
October	3.43	2.85	3.56
November	1.07	0	0
December	0	0	0
Total	58.4	51.91	64.89

Facility Description

The poplar tree reuse system for any of the sub-options would include pump station (s), potentially a storage facility, distribution pipeline, irrigation system, and monitoring and control facilities, as well as planting and establishment of poplar trees. These items are discussed in further detail in the following sections.

Storage Facility. As indicated in the water balance analysis, the storage requirement for the sub-options would be the 80 acre-feet required for the industrial flow. As mentioned in Chapter 7, proximity to the WWTF is an important consideration at this level of analysis. Therefore, the land closest to the WWTF is considered as the primary location for the storage facility. Additional work would be required to adequately determine the best available reservoir site. The land required for the storage would be 8 acres.

Table 9-6
Water Balance Summary

Sub-Options	Irrigated Acres- Poplar Trees (acres)	Effluent Applied/ Reused (mg)	Potential Supplemental Wtr Required (mg)	Rickreall Creek Discharge (mg)	Maximum Storage (ac-ft)
2a. WWTF Summer Irrigation May - November; Industrial Reuse	636	763.63	183.72	737.42	0, Potential Operational Storage
2b. WWTF Summer Irrigation July - October; Industrial Reuse	250	386.9	0	930.43	0, Potential Operational Storage
2c. Summer Irrigation - Industrial Flow Only	70	73.2	29.43	0	80
2d. WWTF Summer Irrigation June - October	350	449.65	0	867.68	0, Potential Operational Storage

Transfer Pump(s), Effluent Pump Station(s), and Filter Station(s). Each sub-option would require a pump station and filter station near the storage facility. The pumps would provide capacity for the average daily flow with additional pumps to provide capacity for the peak daily flow. All pumps would be equipped with variable frequency drives that would allow the pumps to be operated over the full range of capacity. A transfer pump station would be required to transfer the industrial effluent to the storage facility.

The pumps at the storage facilities would pass through a filter station consisting of screen filters. As with the pumps, the filters would be staged in pairs to provide capacity for the average daily flow and peak daily flow, with one redundant filter. The filters would be equipped with self-cleaning, automatic suction scanners and 150-mesh filtration screens.

A chemical injection system would be installed downstream of the filter station to allow injection of supplemental fertilizer, pesticides, herbicides, chlorine, or acid as necessary. This system would include an injection pump and appropriate storage and mixing equipment.

Pipeline/Distribution/Application System. The pipeline system for each sub-option would consist of the mainline piping network and valve clusters that would control flow into separate 30-acre irrigation blocks. The PVC mainline pipe would provide capacity to distribute the peak daily flow to each of the valve clusters. An additional transfer pipeline would be required to convey the industrial flow to the storage facility.

Each valve cluster would be centrally located to control operation of four adjacent irrigation blocks. Each manifold would be fabricated from galvanized steel and equipped with two electric control valves for each block being served by the manifold. The pair of control valves would allow the irrigation laterals in each block to be fed from both ends to improve hydraulic operation of the system. Each manifold would also be equipped with a flowmeter and pressure transducer for remote monitoring of system performance and a manual valve that allows the cluster to be isolated from the mainline during maintenance.

The two automatic valves controlling each irrigation block would feed two buried submain pipes that would allow the irrigation laterals to be fed from both ends. This configuration would minimize the number of valve stations required and maximize the allowable length of each lateral. A flexible PVC riser tube would be used to connect the polyethylene tubing laterals with the buried submains.

The irrigation application system would feature small, low-pressure sprinklers with pressure compensating flow control nozzles that maintain a constant flow rate over a relatively wide pressure range. Flow is controlled by a flexible diaphragm in the nozzle which deflects under pressure and restricts the size of the flow passage. In addition to maintaining a uniform flow rate throughout the irrigation block, this flexing action offers the additional benefit of reduced nozzle plugging caused by debris in the irrigation water.

The sprinklers and above-ground lateral tubing can be conveniently retrieved from the field prior to tree harvest. After harvest, the tubes and sprinklers can be returned to their original positions.

Monitoring and Control Description

Monitoring System. The poplar tree reuse system is essentially a soil moisture management system. Performance of this system is therefore based on measurements of irrigation and precipitation inputs to the soil, and soil moisture levels throughout the tree root zone.

A central control system would be used to automate the collection and storage of monitoring data. Precipitation would be measured with an automated rainfall gauge installed on-site. Irrigation inputs would be recorded during operation by the central controller. Soil moisture would be measured with equipment based on time domain reflectometry (TDR), and possibly other methods as well.

The TDR monitoring system is based on a network of semi-permanent probes installed in the soil throughout the site. The probes are 4 feet in length, with five discrete sensing points located along the length of the probe. Probes are typically installed at two different depths to monitor soil moisture over a total depth of 8 feet.

A portable TDR sensor is used to acquire readings from each of these probes. Soil moisture readings are obtained by connecting the TDR sensor to each probe with a data cable. The sensor sends signals to the probe and the soil moisture levels at various soil depths are computed from the signals returning to the sensor.

The TDR monitoring system would include two TDR sensors and a network of TDR probes installed throughout the site. One sensor would be installed in the field and dedicated for continuous communication with the central controller. The other TDR sensor would be equipped with an internal datalogger and used to manually collect readings from the other probes. Custom software would be used to facilitate management of the manually collected data and to integrate the data with the primary operations database.

Central Control System. A central control system would be installed to control the operation of the irrigation and monitoring systems. This includes the following functions:

- Monitoring water levels in the storage/equalization tank

- Operation of the irrigation pumps
- Flow and pressure monitoring at the farm pump station
- Operation of the automatic filters
- Operation of filter flushing
- Operation of the filtrate grinders
- Flow and pressure monitoring at the farm filter station
- Operation of the chemical injection system
- Operation of irrigation supply valves at each distribution manifold
- Flow and pressure monitoring at the distribution system manifolds (valve clusters)
- Monitoring of TDR soil moisture measurements
- Remote communications

The central control system would be customized to simplify system operation and management of operations data. The system would also be equipped to allow remote monitoring and operation of all system components via telephone modem.

Cost Evaluation

Based on the unit costs and assumptions described in the Cost Evaluation section of Chapter 7, Tables 9-7 through 9-9 present a comparison between liquid treatment and disposal cost estimates for the four sub-options described earlier in this chapter. The tables show that Sub-option 2b has the second lowest capital cost, the lowest annual O&M cost, and the lowest present worth cost. Sub-option 2c has the lowest capital cost and the second lowest present worth cost.

The present worth costs for sub-options 2a, 2b, and 2c are within 10 percent of each other, which suggests that non-cost factors should be a significant consideration in selecting the optimum option. Option 2d is not considered further based on its significantly higher capital, O&M, and present worth cost.

Verification of Critical Design Data/Assumptions

Sub-options 2a, 2b, and 2c have similar present worth costs, are all subject to significant potential impact from adjustments to metals removal design criteria, and have a common base treatment component (advanced secondary biological). The size and cost of the irrigation component in 2a, 2b, and 2c is directly controlled by predicted WWTF effluent quality. The predicted quality and Rickreall Creek flows determine whether discharge to the creek may exceed water quality criteria during any time period. Figure 4-3, which forms the basis of costing for sub-options 2a, 2b, and 2c, is a result of using several assumptions.

Table 9-7
Rickreall Creek Discharge and Summer Irrigation Sub-options
Relative Capital Cost Estimates

System Component	Capital Cost Estimates (1995 $, Millions)			
	2a	2b	2c	2d
	Advanced Biological Without Filtration	Advanced Biological With Filtration	Advanced Biological and Chemical with Filtration	Conventional Biological With Wetlands
Liquid Treatment				
Operations and Control Building	0.6	0.6	0.6	0.6
Influent Pumping	1.6	1.6	1.6	1.6
Headworks	0.6	0.6	0.6	0.6
Aeration	3.8	3.8	3.8	1.4
Secondary Clarification	2.9	2.9	2.9	2.9
Filtration	0.0	1.5	1.5	0.0
Tertiary Clarification	0.0	0.0	3.2	0.0
Disinfection/Dechlorination	1.0	1.0	1.0	0.7
Wetlands	0.0	0.0	0.0	39.0
Wetlands Land	0.0	0.0	0.0	1.1
Reaeration	0.4	0.4	0.4	0.4
Intermediate Pumping	0.0	0.0	0.0	0.5
Treatment Subtotal	**10.9**	**12.4**	**15.6**	**48.8**
Liquid Disposal				
WWTF Effluent Storage	0.0	0.0	0.0	0.0
WWTF Effluent Pumping	0.4	0.2	0.0	0.3
WWTF Pipeline/Distribution	8.2	3.5	0.0	4.7
WWTF Irrigation Site Land	1.1	0.6	0.0	0.8
Industry Effluent Storage	1.5	1.5	1.5	1.5
Industry Effluent Pumping	0.1	0.1	0.1	0.1
Industry Pipeline/Distribution	1.1	1.1	1.1	1.1
Industry Irrigation Site Land	0.2	0.2	0.2	0.2
Outfall	0.2	0.2	0.2	0.2
Disposal Subtotal	**12.8**	**7.4**	**3.1**	**8.9**
Treatment and Disposal Total	**23.7**	**19.8**	**18.7**	**57.7**

Table 9-8
Liquid Treatment and Disposal Alternatives
Relative O&M Cost Estimates

System Component	System O&M Cost Estimates (1995 $, Millions)			
	2a	2b	2c	2d
	Advanced Biological Without Filtration	Advanced Biological With Filtration	Advanced Biological and Chemical with Filtration	Conventional Biological With Wetlands
Labor	0.19	0.19	0.22	0.14
Power	0.13	0.12	0.12	0.10
Chemicals	0.10	0.14	0.17	0.05
Maintenance	0.21	0.17	0.17	0.55
Total O&M Costs	**0.63**	**0.62**	**0.68**	**0.84**

Table 9-9
Liquid Treatment and Disposal Alternatives
Relative Present Worth Cost Estimates

System Component	Present Worth Cost Estimates (1995 $, Millions)			
	2a	2b	2c	2d
	Advanced Biological Without Filtration	Advanced Biological With Filtration	Advanced Biological and Chemical with Filtration	Conventional Biological With Wetlands
Capital Cost	23.7	19.8	18.7	57.7
Present Worth of O&M Cost	6.0	5.9	6.5	8.0
Present Worth Costs	29.7	25.7	25.2	65.7
Present Worth of Salvage Value	2.5	1.6	1.0	5.4
Present Worth Poplar Revenue	2.7	1.2	0.3	1.6
Total Net Present Worth Cost	**24.5**	**22.9**	**23.9**	**58.7**

Effluent quality parameters may vary from the predicted values for several reasons. Limited data exist to determine the background domestic wastewater concentrations of metals, which is what would be influent to the plant after industrial contributions are separated. The current influent assumptions are based on a limited number of random measurements. The actual influent concentrations could be lower or higher than the assumptions, in which case the costs would need to be reevaluated. Depending on actual measured concentrations, the City may consider implementing source controls such as lead and copper corrosion control in the water distribution system. Metals removals assumed through activated sludge, tertiary chemical treatment, and filtration are average values based on literature reports and past experience with similar systems. Actual removals may vary over a wide range, which would again impact sizing and cost of the treatment/disposal options. Similarly, inadequate characterization is available for influent total and orthophosphate, and temperature and DO may be affected by unpredictable seasonal variations. Possibilities also exist to manipulate Rickreall Creek stream flow, which is the other major factor affecting stream water quality. Options for flow augmentation were discussed in Chapter 7, and augmentation by increased reservoir storage was identified as a feasible undertaking, currently being evaluated in separate studies.

Because of these limitations, it would be a distinct advantage to implement a plan that incorporates thorough testing as a means to avoid addition of costly components unless they are required for compliance.

Optimization Recommendations

The similarity of sub-option 2a, 2b, and 2c costs, the need for verification of critical data, the possibility of flow augmentation, and the common components in 2a, 2b, and 2c all suggest that the most logical planning approach would be to initially implement only the common components, plus filtration (common to option 2b and 2c). This would achieve several of the improvement objectives and provide an opportunity for the City to collect critical data and verify assumptions through sampling, monitoring, and testing. The data may then be used to make an informed, responsible selection of additional components to implement.

The following recommendation is therefore made for liquids treatment and disposal improvements at the Dallas WWTF:

- Advanced biological treatment with filtration
- Separate industrial effluent irrigation (including industrial effluent storage pond, pumping, and distribution)
- Supplemental influent and effluent characterization and verification of process performance
- If in-stream water quality impacts observed or anticipated, one of the following could be implemented:
    - Flow augmentation
    - Tertiary chemical treatment
    - Poplar irrigation of domestic WWTF effluent
    - Water system source controls

A discussion of how the recommended improvements provide compliance with water quality criteria is provided in Chapter 10.

Facility Plan Summary

Based on the analyses and evaluations performed, a comprehensive set of recommendations is presented in this section for collection system improvements, liquid treatment and disposal, and solids handling and disposal.

Collection System Improvements

The proposed improvements to the wastewater collection system are recommended to improve the capacity limitations and avoid overflows in the existing system. The new interceptors will provide sewer service to areas not now served by the system. This section describes the recommended system improvements; Table 9-10 summarizes the projects. The locations of the improvements to the system are shown in Figure 9-1.

La Creole Interceptor. A new 30-inch-diameter parallel relief sewer along the existing La Creole Interceptor is required if the sewer system is to convey the projected flows. The existing interceptor's capacity is now exceeded at less than the 5-year design storm. The new parallel sewer should extend from the influent pump station at the wastewater plant upstream and adjacent to the existing sewer until it reaches manhole 57-09. At this manhole the interceptor that continues west would be diverted into the new 30-inch relief sewer. At manhole 57-09 another new 27-inch interceptor would begin, follow an existing 12-inch sewer across La Creole Creek. This sewer would be called the Ash Creek Interceptor.

Ash Creek Interceptor. A new 27-inch sewer is needed to convey the wastewater from Basins 3, 4, 5, 9, and 10 to the La Creole Interceptor. This new sewer would also serve those areas in Basins 3 and 9 that currently do not have access to the sewer system. The new sewer would begin at existing manhole 57-09 and follow an existing sewer across La Creole Creek to Orrs Corner Road. From Orrs Corner Road the sewer would run southwesterly towards the Godsey Road Sewage Lift Station. At Godsey Road the sewers entering the pump station would be diverted into the new gravity sewer, and the lift station would be decommissioned. From Godsey Road the new sewer would run northwesterly to the existing manhole 13-85 at the intersection of Ash and Fenton Streets. At the manhole the existing 27-inch sewer would be diverted into the new Ash Creek Interceptor. This diversion would eliminate the need for the existing bypass point at La Creole Creek just downstream from the new connection point. This diversion of the flow into the new interceptor will relieve the downstream siphon crossing and interceptor from its current capacity limitations.

City Park Replacement Sewer. The existing 12-inch-diameter sewer that flows through the city park currently suffers from capacity and grade problems. The existing pipe is also known to contribute excessive infiltration into the sewer system. The segment that requires replacement runs from the east end of Park Street easterly through the park to the intersection of Walnut and Leevins Street. The replacement pipe could follow the current alignment.

Table 9-10 Summary of New Conveyance Facilities				
Facility	Capacity (mgd)	Diameter (inches)	Length (feet)	Estimated Capital Cost (1995 $, Millions)
La Creole Relief Sewer	12	30	6,000	0.7
Ash Creek Interceptor	10	27	6,200	1.2
City Park Replacement	1.5	12	2,350	0.2
TOTAL				$2.1

Inflow and Infiltration Reduction Program. The recommended levels of I/I reduction for the wastewater collection system are shown in Table 5-7. The I/I reduction program should be implemented only after further investigation into each of the identified basins. The subsequent sewer repairs could be phased over a period of years as discussed in the Recommended Plan Cost Estimate section, which follows. A continuing I/I reduction program should follow after the initial recommended removal is completed. An annual fund used for source detection and removal should be established by the City.

Liquid Treatment and Disposal

The recommended liquid treatment and disposal facility improvements include the following (see Figure 9-2):

- Separate new industrial waste irrigation system including conveyance, storage pond, distribution, and disposal facilities, and continued domestic effluent discharge into Rickreall Creek (see Chapter 7)
- New influent pump station (see Appendix C)
- New coarse bar screens and screenings press (see Appendix C)
- New plug flow aeration basins (see Appendix C, Option 2)
- Three new secondary clarifiers (see Appendix C)
- New coagulation facility (see Appendix C)
- New moving bed continuous backwash filters (see Appendix C)
- New sodium hypochlorite disinfection facility (see Appendix C)
- New chlorine contact tanks (see Appendix C)
- New sodium bisulfite dechlorination facility (see Appendix C)
- New surface mechanical post aeration (see Appendix C)
- New Rickreall Creek outfall
- Supplemental characterization and verification of process performance

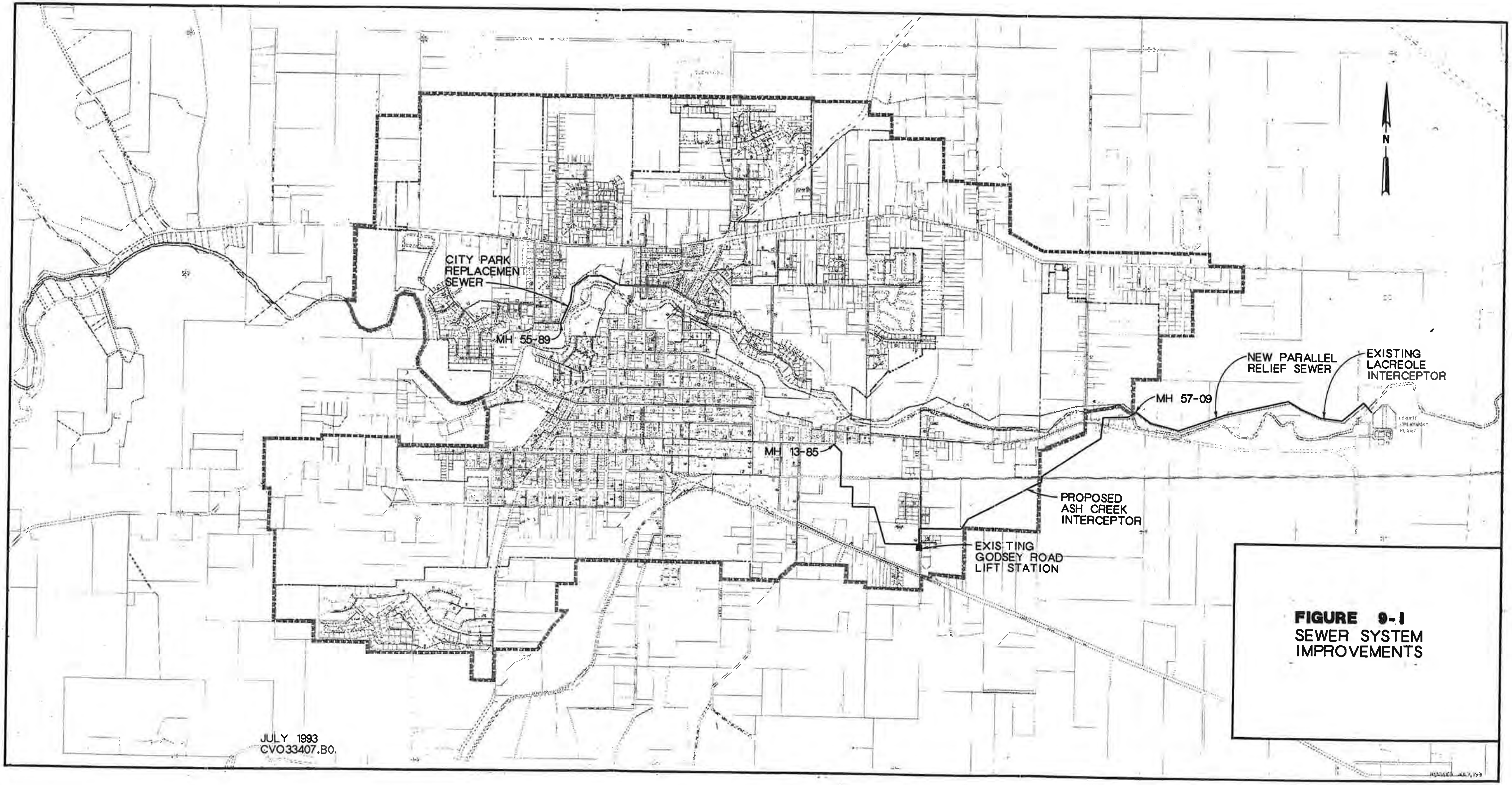

FIGURE 9-1
SEWER SYSTEM
IMPROVEMENTS

j:*nfs*dallas*cvo33407*33407f91.dgn

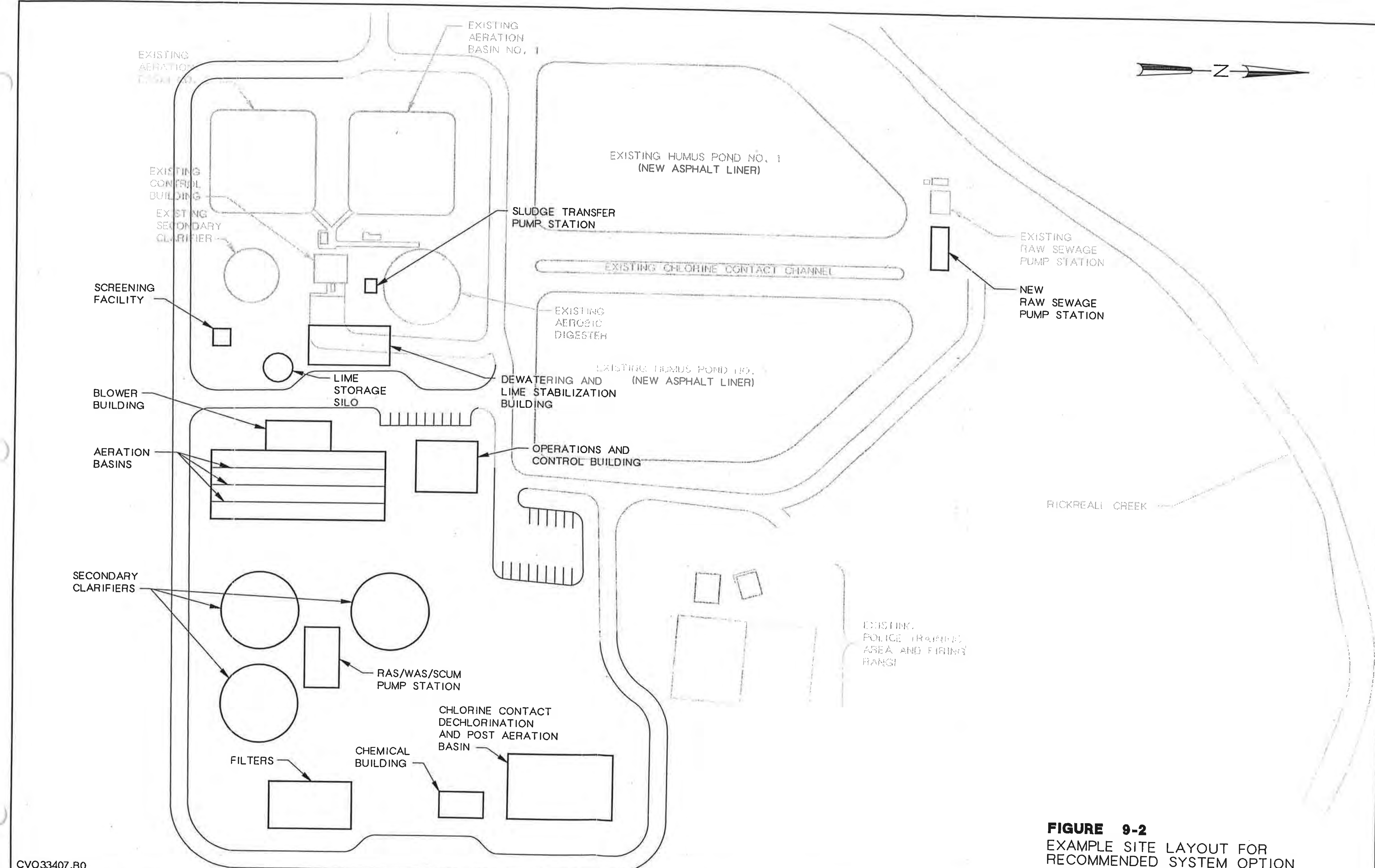

FIGURE 9-2
EXAMPLE SITE LAYOUT FOR RECOMMENDED SYSTEM OPTION

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- If water quality impacts are observed, add one of the following:
  - Flow augmentation with increased reservoir storage
  - Tertiary chemical treatment
    - Chemical addition
    - Tertiary flocculator clarifiers
  - Poplar irrigation with domestic WWTF effluent
    - New effluent pump station (see Appendix C)
    - New plant effluent conveyance pipeline to the poplar irrigation site (see Chapter 7)
    - New plant effluent poplar irrigation distribution and disposal system (see Chapter 7)
  - Water system source controls

Although the treatment and disposal capacity provided is for the year 2020, the projected increase in flow is gradual so that most of the capacity will be required at startup. Phasing of liquid treatment and disposal facilities will therefore require a nonconventional approach, and is described in more detail in Chapter 10.

Sludge Stabilization and Disposal

As presented in Chapter 8, Solids Sludge Option 4, Existing Facilities with Sludge Dewatering and Year-Round Lime Stabilization, is the recommended sludge stabilization alternative. Solids Option 4 has the lowest capital cost, the second lowest annual O&M cost, and the lowest present worth cost. It also has the highest non-cost score. Flexibility is provided with this option to allow both landfill and land application disposal. The recommended sludge stabilization alternative includes the following:

1. Use of existing aerobic digester for aerated sludge storage
2. Existing humus ponds with liner rehabilitation
3. New dewatering building with odor control
4. New sludge transfer pumps
5. New belt filter press
6. New polymer storage, feed, and mixing equipment
7. New lime storage silo and feed equipment
8. New double screw conveyor
9. New sludge loading and dewatered cake storage facility

Wastewater Management Program Cost Estimates

Estimated capital and annual operation and maintenance costs were developed for the recommended wastewater system improvements summarized above. Cost estimates were developed in accordance with the procedures outlined in Chapter 7 and are intended to reflect 1995 costs.

Capital Costs

Estimated capital costs for the recommended wastewater system improvements are summarized in Table 9-11. More detailed component costs are included in Chapters 7 and 8 and previously in Chapter 9. The capital costs for new interceptors and sludge treatment and disposal in Table 9-11 are slightly lower than previously summarized in the respective tables because the City proposes to accelerate construction of two components under a separate budget. The two components to be accelerated are replacement of the city park interceptor and lining of one of the two humus ponds. Capital costs associated with these components are therefore not included in Table 9-11.

If supplemental characterization and performance verification indicates water quality impacts, additional capital costs will be incurred. To provide an estimate of these additional costs, it is assumed that poplar irrigation with WWTF effluent will be the selected additional component. The liquids disposal cost will then increase from $3.1 million to $7.4 million, along with a $0.6 million increase in engineering, legal, and administrative cost, resulting in the total capital cost increasing from $26.6 million to $31.5 million.

Operation and Maintenance Costs

The City will assume responsibility for the operation and maintenance (O&M) of the existing wastewater and sludge facilities and recommended wastewater system improvements. Operation and maintenance costs include the costs for labor, power, chemicals, equipment, and supplies to operate and maintain collection system pipelines and pump stations, treatment plant facilities, and the sludge reuse program. The labor costs for treatment plant O&M, which are dictated in part by state and federal operation and safety regulations, comprise the major component of the total annual O&M costs.

Table 9-11
Program Capital Cost Summary

Recommended Improvements	Estimated Capital Cost (1995 $, Millions)
Collection System Improvements	
New Interceptors	1.9
Source Reduction (Infiltration and Inflow)	3.7
Treatment System Improvements	
Liquids Treatment	12.4
Liquids Disposal	3.1
Sludge Treatment and Disposal	2.0
Engineering, Legal, and Administration	3.5
Total Capital Cost	26.6

Treatment plant staffing requirements have been approximated based on the selected treatment alternatives. Actual plant staffing requirements will depend on factors such as:

- Plant layout
- Level of staff training and experience
- Plant instrumentation and control system

- The amount of work contracted out, such as lab work, sludge hauling, and specialized maintenance work
- The number of plant operating shifts and staff allocation to each shift

DEQ classifies the Dallas WWTF as a Level III facility. The collection system is also classified as Level 3. The DEQ requirements associated with Level 3 are that at least one designated supervisor be certified at Treatment Level 3. For the collection system the supervisor must have Collection Level 3 certification. Any additional operating shifts at the treatment plant must have a supervisor with at least Level 2 certification.

One shift was assumed year round. The approximate staffing requirements for the Dallas wastewater collection and treatment system are shown in Table 9-12. One additional staff member will be required for the treatment plant if WWTF effluent irrigation is required to address potential water quality impacts that may be identified.

Table 9-12
Wastewater Collection and Treatment Plant Staffing

General Work Description	Approximate Number of Staff
Supervisory	1
Collection System	3
Treatment Plant (Liquids and Solids)	4
Totals	8

These staff approximations are based on EPA statistics and on staffing at local plants with similar treatment processes and flows. When flow increases or as monitoring requirements change, additional staff may become necessary. In addition to the supervisory staff having at least one Treatment Level 3 certification, supervisors for all shifts will have at least Level 2 certification. The remaining operations staff are expected to have at least Treatment Level 1 certification.

The annual O&M cost in 1995 dollars for the proposed new wastewater collection, treatment, and disposal facilities is estimated to be $0.88 million. Table 9-13 provides a breakdown of the estimated collection, treatment, and disposal O&M costs for the improved facilities.

The O&M costs associated with the liquid treatment and disposal component will increase if WWTF effluent irrigation is required to address potential water quality impacts that may be identified. The total annual O&M cost will then increase to $0.96 million in 1995 dollars.

Table 9-13 Estimated Annual O&M Costs (1995 $, millions) Collection, Treatment, and Disposal Facilities					
Component	**Labor**	**Power**	**Chemicals**	**Maintenance**	**Total**
Collection System	0.09	0.01	0	0.08	0.18
Liquid Treatment and Disposal	0.15	0.11	0.14	0.14	0.54
Sludge Stabilization and Disposal	0.07	0.02	0.03	0.04	0.16
Total	0.31	0.14	0.17	0.26	0.88

The projected timing of each expenditure is presented in Table 9-14. Because of funding limitations, it is proposed that the source reduction expenditure be distributed over a longer period than that for the other improvements. Three hundred thousand dollars would be budgeted annually on this item for 12 years beginning 1996. The engineering, legal, and administrative costs are allocated over the design and construction phases as shown in Table 9-14. The engineering portion of these costs includes the design, services during construction, and inspection.

Environmental Impacts and Mitigation

Environmental reviews are commonly required for major public wastewater treatment projects as a result of numerous federal, state, and/or local regulations. For this project, applicable regulations could include (but are not necessarily limited to) the following:

- Compliance with the national Environmental Policy Act (NEPA) because the project may use federal funds or require federal permits
- State requirements for an environmental assessment prior to awarding State Revolving Fund (SRF) loans pursuant to Oregon Administrative Rule Part 340 Division 54—State Revolving Fund Program
- Local land use reviews that address environmental impacts pursuant to the requirements of the Polk County Zoning Ordinance
- Environmental data will likely be required for the local land use applications submitted to the county. Additionally, the City is expected to choose to apply for an SRF loan, which would require a standalone Environmental Assessment (EA) document that is similar in intent and format to federal EAs typically required pursuant to NEPA. Detailed environmental data regarding the recommended alternatives are presented in Chapters 7 and 8. Much of the data contained in those chapters regarding existing conditions and short- and long-term environmental impacts resulting from the construction and operation of the recommended wastewater system improvements can be used in preparing the standalone EA and associated county land use permits. The purpose of this section is to provide a brief environmental review of the recommended option as previously described in this chapter under Facility Plan Summary, based on data collected during the course of developing this Facilities Plan. Although much of the following discussion addresses potential impacts resulting from poplar irrigation using the separated industrial effluent, it is generally recognized that many of the potential impacts may be more substantial should the characterization and verification of process

Table 9-14
Projected Capital Cost Expenditures[a]
(1995 $, Millions)

Improvements	**Fiscal Years**													
	Totals	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Collection System														
Interceptors	1.9			0.8	0.8	0.3								
Source Reduction[b]	3.7	0.1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Treatment System														
Liquids	15.5			6.9	6.9	1.7								
Sludge	2.0			0.8	0.8	0.4								
Engineering, Legal, and Administrative	3.5		1.4	0.9	0.9	0.3								
Total Capital Cost	**26.6**	**0.1**	**1.7**	**9.7**	**9.7**	**3.0**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**	**0.3**

[a]All cost figures are presented in 1995 dollars, regardless of the year that they are allocated.
[b]Beyond the year 2008, it is recommended that approximately $50,000 be budgeted annually for continued source reduction.

performance result in possible expansion of the poplar irrigation program to include domestic effluent, or in other measures such as flow-augmentation. Data presented in the aforementioned sections are summarized and/or supplemented, and possible measures to offset unavoidable impacts are presented.

The following discussion focuses on the potentially beneficial and adverse impacts that the recommended option would have on the environment.

Public Health

The proposed wastewater collection and treatment system improvements will benefit public health in the Dallas and Rickreall area by substantially reducing untreated sewage that enters Rickreall Creek during wet weather conditions by using the domestic effluent as irrigation on poplar fields. Improvements to the solids waste disposal process will produce sludge that is more suitable for disposal at landfills and/or in land application options.

The treatment system requires onsite storage of some chemicals. Accidental leakage or spillage of chemicals handled at the wastewater treatment facility could occur.

Possible Mitigation Measures

The potential impacts to public health resulting from accidental chemical leakage and/or spillage can be reduced by engineering controls specified in a hazardous materials management program developed for the plant.

Agricultural Lands

The recommended option's potential short-term, adverse impacts to agricultural activities in the project area would result primarily from construction activities. Direct adverse impacts could result from a potential loss of crop production on small portions of farm tracts impacted by the industrial irrigation facilities. However, because most of the properties to be used for industrial effluent irrigation pipelines, storage ponds, and industrial application fields are expected to be located in generally contiguous agricultural fields (probably only divided by roadways) near the treatment plant, significantly adverse direct impacts to agricultural properties that are unassociated with the project are not expected to result. Consequently, because of the limited amount of land affected on any one farm tract, or combination of farm tracts, the independent or cumulative effects are not expected to be significant.

Possible long-term direct impacts to farmland productivity, each event being of relatively short duration, could result from infrequent industrial effluent pipeline maintenance requirements on agricultural fields unassociated with the project. Appropriate buffers (to be defined during preliminary design stages of the project) would be expected to preclude any tree planting, maintenance, and/or harvesting activities from adversely impacting adjacent agricultural properties.

Long-term benefits of introducing industrial effluent irrigation onto agricultural properties not currently irrigated, generally south of the treatment plant, would include increasing the productivity potential of these fields by improving the soil nutrient and moisture levels on the properties. The recommended option's use of effluent irrigation to produce wood fiber rather than food crops would change localized agricultural land use patterns in the area. This in turn could result in a slight shift in expenditures and productivities of the agricultural/forestry sectors of the local economy. As evidenced by other similar wood fiber crops being produced in the project vicinity, such shifts would not be unique in the area, and would not be expected to result in significant overall socioeconomic impacts.

Improving the productivity potential of project-related agricultural properties would be counterbalanced to an undefined extent by potential reductions in the productivity potential of farming operations that rely on water withdrawals downstream from the existing Rickreall Creek effluent outfall. Displacing approximately 0.2 mgd of industrial effluent that is currently discharged back into the stream and made available for downstream irrigation purposes could adversely affect short-term production of irrigation-dependent crops grown by several commercial farming enterprises that are generally located east of Highway 99W on properties adjacent to or near the creek. Although reduced amounts of available irrigation water could preclude production of some crops, removal of irrigation water would not necessarily preclude agricultural use of these properties. The impacts would be most significant to individual farmers. Potential adverse impacts to the general vicinity's agricultural economy would not be expected to be significant, although its diversified base would be slightly lessened as the properties may convert to nonirrigated dry-land farming uses. In the long term, increased discharges to Rickreall Creek of treated domestic effluent generated by an increased service population in the future would probably offset the removal of the industrial effluent.

Additional indirect impacts resulting from the proposed facility improvements could include loss of agricultural land through expansion of urban development facilitated by the improvement of the treatment plant capacity. However, any such development that would be consistent with the Polk County Comprehensive Plan and the City of Dallas Comprehensive Plan has been considered in developing the Facilities Plan. Other "induced" development not consistent with these plans would require independent local land use approvals, and expanded capacity of the treatment plant (dedicated to accommodate expected growth rates based on existing land use planning designations) could not be logically used to justify further unplanned development.

Farmland Protection Act (7 U.S.C. 4202(a))

If federal assistance is pursued by the City of Dallas, compliance with Section 1541(b) of the aforementioned Act must be illustrated. The increase in productivity potential of agricultural lands that would benefit from introduced industrial effluent irrigation could result in improved classification of the properties relative to the Act. Conversely, the decrease in short-term productivity potential of agricultural lands that might be adversely affected by reduced access to irrigation water downstream from the current effluent outfall, could result in reduced classification of the properties relative to the Act.

Possible Mitigation Measures

Conversion of agricultural land is permitted and justified by the necessity to improve public utility facilities for public health and safety and overall protection of the natural environment. A Natural Resource Conservation Service (NRCS) *Farmland Conversion Impact Rating Form* might need to be completed and reviewed by the agency.

In designing the storage pond and irrigation systems, adequate buffer space should be provided between the facilities and adjacent uses in a manner that minimizes potential impacts to adjacent uses. This shall consider factors such as herbicide/pesticide, and/or irrigation overspray, and solar access.

Coastal Zone Areas

The eastern boundary of the Oregon Coastal Zone pursuant to the Coastal Zone Management Act of 1972 (PL 92-583) is the crest of the Coast Range Mountains. Therefore, no coastal zone areas will be impacted by this project.

Water Resources

Wild and Scenic Rivers

No federally designated wild and scenic rivers pursuant to the Omnibus Oregon Wild and Scenic Rivers Act of 1988 (PL 100-557), or state-designated scenic waterways pursuant to the Oregon Scenic Waterway Act of 1968 (PL 90-542) are located in the project vicinity. Therefore, no waterways subject to these laws will be affected by the recommended improvements.

Surface Water Quality

Construction of exposed surfaces at the treatment plant could increase short-term levels of sedimentation in surface waters adjacent to and/or in Rickreall Creek. Potential accidental releases of hazardous materials into surface waters could also occur during construction of the recommended system improvements.

Direct, long-term benefits may be realized for the waters of Rickreall Creek because of the improved effluent quality of discharges to the stream.

The potential elimination of industrial effluent discharges to the stream may, to an unknown degree, affect the stream's water quality by reducing the amount of water available to dilute nonpoint source pollution entering the stream below the current outfall. Because discharging the full amount of effluent into Rickreall Creek would actually reduce the overall rise in the stream's summer water temperature, displacement of the industrial effluent streamflow under the recommended option could further adversely affect the water temperature quality of the stream.

Indirect impacts of such surface water quality/quantity impacts to aquatic resources are discussed below under "Wildlife and Wildlife Habitat."

Direct, long-term adverse impacts to surface water quality could result from additional impervious surfaces constructed at the treatment plant site that could increase stormwater runoff of pollutants to surface waters. Impervious surfaces would include additional roadway, parking areas, structures and building roofs. Pollutants would include metals or hydrocarbons that leak from vehicles that are parked or being repaired on the site, or metals from roofing materials. Effluent irrigation and/or sludge application could increase nutrients entering surface waters from drain tile outfalls.

Possible Mitigation Measures

Potential adverse impacts to the water temperature of Rickreall Creek could be partially offset by developing and implementing a program of streamside riparian vegetation rehabilitation along City-owned/controlled reaches of the stream. The riparian rehabilitation program should be coordinated with the ODFW and NRCS, and be developed by a professional biologist with experience in riparian habitat rehabilitation in temperate environments.

Short-term construction impacts can be reduced by use of filtration fences, hay bales, temporary sedimentation ponds, and mulching to protect exposed soils and stockpiles, and to reduce soil erosion and sedimentation. Minimizing the amount of hazardous materials on construction sites (or storing them in a temporary containment area during construction) would reduce potential impacts resulting from accidental spillage. Containment facilities would consist of an impervious membrane with retaining curbs. Refueling areas could be temporarily asphalted to control possible spillage impacts to surface waters and/or ground contamination. A spill prevention, containment, and countermeasure plan should be in place to address potential spills during construction.

Long-term impacts to stormwater infiltration and runoff can be substantially reduced by collecting and conveying stormwater runoff from impervious surfaces to infiltration facilities located in areas with highly permeable soils or biofiltration swales. Structures and buildings will be constructed with nontoxic roofing and exposed metallic surfaces will be painted to reduce leaching of metals. Reduction of long-term impacts to surface waters resulting from sedimentation and soil erosion of exposed soils can be reduced by matting, planting grasses or shrubs, and/or mulching steep excavated slopes and/or barren areas. Potential agricultural field drain tile outfalls from fields receiving effluent irrigation and/or sludge may need to be monitored for significant increases in water nutrient loads. Application levels should be modified if nutrient loads are significantly affected.

Groundwater Resources

Sole Source Aquifer and Recharge Areas. No state-designated sole source aquifers or groundwater recharge areas are located on or near the project area. Consequently, no impacts are expected.

Wellhead Protection Areas. No wellhead protection areas have been designated in the project area or vicinity. Therefore, no impacts are expected.

Groundwater Quantity and Quality. Short-term adverse impacts could include releases of hazardous materials (gasoline, solvents, etc.) during construction that could infiltrate the groundwater.

As discussed under "Surface Water Quality," long-term localized increases in stormwater runoff from roof drains, roadways, and parking areas are likely to discharge into dry well and/or other infiltration facilities. Use of drywells could increase the potential for mounding of groundwater beneath these facilities. Contaminants from the impervious surfaces could be introduced to groundwater via these facilities.

Operation of the storage pond could result in localized infiltration of nutrients and metals into groundwater. However, use of common construction materials and techniques should minimize the potential for such impacts.

Industrial effluent irrigation and/or sludge land application could result in localized infiltration of nutrients and metals into groundwater. Continued sampling of influent and effluent, particularly with respect to metals and TDS, will be conducted to allow sizing the poplar tree fields to accommodate loads without harm to groundwater resources.

Possible Mitigation Measures

Engineered controls incorporated into the stormwater dry wells and infiltration systems, and implementation of a hazardous materials management program would reduce the introduction of contaminants into the groundwater system. Segregating roof and roadway runoff would permit control and distribution of impacts to groundwater tables and quality.

In constructing the storage pond, commonly used construction materials and techniques shall be used to minimize potential leaks and infiltration of effluent into groundwater. Synthetic liners carefully covered by earthen materials, or various types of earthen materials mixed to form impervious liners should be used.

Effects of nutrient loads to groundwater levels and water quality underlying agricultural fields to which effluent and/or sludge are applied should be monitored. Monitoring might include monitoring wells. Application should be at the appropriate agronomic rates.

Floodplains

Construction of improvement facilities at the treatment plant might affect a small area of Zone A floodplain. The outfall location on Rickreall Creek could affect Zone A floodplain and/or the floodway. Impacts are not expected to significantly affect flood elevations at any one point.

Possible Mitigation Measures

Ground-disturbing activities that could affect flood elevations may require a floodplain development permit issued by Polk County. No floodway modification application should be required by FEMA regulations.

Wetlands

The treatment plant property contains wetlands associated with Rickreall Creek and another possible palustrine wetland. Fields potentially used for effluent irrigation and/or sludge land application could contain wetland conditions. Soil conditions suggest that wetland conditions may exist in large areas of the project vicinity. Compliance with Executive Order 11990, Protection of Wetlands, and Section 404 of the Federal Clean Water Act, must be demonstrated. Construction of a new outfall in Rickreall Creek may also trigger the need for a Section 404 review and need for a COE permit. Effluent irrigation and/or sludge land application could involve discharge and/or fill, which could require permits from various agencies. Because wetland permitting issues could substantially extend project schedules, wetlands should be identified as soon as possible and avoided if practicable.

Displacing the industrial effluent discharge to Rickreall Creek could affect primarily mudflat wetlands within the Rickreall Creek channel by seasonally altering the hydrologic conditions that maintain some of the wetlands, particularly during the summer months. The hydrologic conditions of some of these wetlands, particularly those downstream from Highway 99W, are also impacted by other water withdrawals from the stream. Based on the results of reconnaissance surveys conducted for the proposed project, these wetland habitats do not appear to be critical habitats for sensitive plant or animal species. These effects would be most substantial during severe drought years. Because removal of industrial effluent would not involve fill or removal within waterways or wetlands, the action would not involve regulatory review pursuant to Section 404 of the Clean Water Act.

The City of Dallas is currently investigating ways to increase water supplies for the city. One of the options being studied includes increasing water storage in the basin. There may be opportunities to increase storage and time releases to minimize the impacts to Rickreall Creek wetlands resulting from displacing the industrial effluent discharge to the creek. Because the domestic flow will likely increase in the future, the loss probably would be minimal, if not offset.

Possible Mitigation Measures

As soon as possible, a field survey by a qualified wetlands specialist using approved identification methodologies should be conducted on affected lands to identify "jurisdictional wetlands" pursuant to Section 404 of the Clean Water Act and Oregon's Administrative Rules for removal-fill permits (OAR 141-85). If survey results indicate presence of wetlands, avoidance or other mitigation measures will be developed through consultation with the U.S. Army Corps of Engineers (COE), U.S. Environmental Protection Agency (EPA), Oregon Division of State Lands (DSL), and other affected agencies.

Any possible impacts to wetlands resulting from the new outfall, effluent irrigation, and/or sludge land application options will be discussed with COE, EPA, Oregon DSL, Oregon DEQ, USFWS, and ODFW. Required NPDES permits would be secured, and an appropriate wetland program would be developed to minimize or mitigate any adverse impacts identified.

The City should continue working with the state agencies and local Rickreall Creek water rights holders to identify potential means to possibly increase water availability for the city and for maintaining existing hydrologic conditions of Rickreall Creek wetlands (considering impacts to hydrology from agricultural withdrawals) that have become established based on historic effluent discharges to the stream.

Air Resources

The project area is located in an area that currently meets ambient air quality standards. Short-term adverse effects to localized air quality from construction (engine emissions and dust) could occur to individual residences near construction sites. Long-term air quality impacts of the treatment plant operations will depend on:

- The level of air pollution control included in the plant design
- The VOC content of the influent (expected to be low)
- The layout of the facility and distance from processes to sensitive receptors (not expected to result in significant effects)
- The frequency of operation and routes used for delivery and sludge trucks, and application of sludge

Odor from the treatment plant is largely generated at the headworks. Odor impacts from the treatment plant could periodically affect the scattered residences currently in the vicinity of the treatment plant. The extent of these impacts would potentially increase through time as the area west of the treatment plant develops with residences at densities consistent with applicable comprehensive plans. However, given general wind directions, which do not blow from east to west from the treatment plant towards such development, these impacts are expected to be minor.

Operation of the industrial effluent storage pond and irrigation system could result in some odor impacts to the widely dispersed farm-related dwellings in the project vicinity. The storage pond could emit some odors. Impacts could be minimized by locating ponds away (not upwind) from existing residences or future residential development areas, and by providing buffer areas between the pond and adjacent properties.

In some situations, effluent irrigation can result in emissions of sulfur odors if anaerobic bacterial growth develops in the distribution system. However, the regular use of chlorine or other oxidizing agent would normally preclude the bacterial growth and the likelihood of sulfur odor emissions. The industrial effluent irrigation may emit earthy odors resulting from nonregulated materials. However, such emissions are expected to be minimized by:

- Use of irrigation sprinklers that would be positioned under the trimmed tree canopy (about not higher than 6 feet above the ground), which would minimize dispersal of fugitive spray and visibility of the system
- Tree leaves catching fugitive irrigation spray
- Development and maintenance of buffer areas between the tree crops and adjacent properties

Possible Mitigation Measures

Periodic water sprinkling and use of dust suppressant and/or temporary cover on exposed soils in the vicinity of residential and commercial development would reduce dust impacts to sensitive receptors. The final plant design shall consider possible air quality impacts to nearby sensitive receptors in developing the plant layout and setbacks. Possible sludge land application sites should be chosen that will minimize air quality impacts (odor and truck exhaust) to rural residential developments, considering prevailing wind patterns and distance from the developments.

The industrial effluent storage pond should be located as far as possible from existing residential development, and from future residential development areas, especially considering prevailing wind patterns from the south, southwest, and west. Buffer areas should be provided to minimize opportunities for odor impacts, and should include vegetation that would minimize dispersal of fugitive irrigation water spray and visibility of the pondage and irrigation systems.

Noise

Short-term noise impacts are expected to be limited to use of heavy equipment during construction. Long-term noise impacts could result from plant operation of onsite equipment, and delivery and possibly sludge trucks. Occasional harvesting of trees after they reach maturity may also result in some localized noise, not substantially unlike noise associated with typical farming operations. Additional information regarding plant equipment and design needs to be developed before impacts can be addressed with respect to DEQ noise control regulations.

Possible Mitigation Measures

Potential for noise impacts could be significantly reduced to acceptable levels by incorporating into the final design the following considerations, especially in areas containing nearby noise sensitive receivers:

- Do not operate heavy construction equipment at night (10:00 p.m. to 7:00 a.m.), on weekends, or on holidays
- Locate stationary construction and treatment plant operation equipment as far from sensitive noise receivers as possible, and position trailers or other quiet stationary objects to block noise when possible
- Do not allow equipment to idle
- If possible given the limited space available, place treatment plant administrative building(s) or other quiet stationary objects, structures, or buildings to block noise transmission to sensitive noise receivers
- Locate truck access points as far from sensitive noise receivers as possible
- Reduce aerator motor noise by using the available noise control equipment
- Cover potentially noisy sources such as fans, blowers, and pumps

Consultations with DEQ and the Polk County Planning Department and Environmental Health Department will help ensure compliance with DEQ regulations and the appropriate County setback requirements.

Light and Glare

Potential long-term adverse impacts from light and glare could include the following treatment plant design features:

- New interior and exterior lighting that might be viewed from offsite
- Reflective surfaces on building/structures

Because of the currently secluded location of the treatment plant, these impacts are not expected to be significant.

Possible Mitigation Measures

Measures could be implemented to minimize potential adverse effects to development that might occur adjacent to the treatment plant. Many of these measures correspond to measures to offset water pollution impacts.

- Paint reflective (metal) surfaces
- Maintain a vegetative buffer/screen between the facility and adjacent properties
- Use internally focused directional lighting

Wildlife and Wildlife Habitat

The recommended option may have a direct, long-term, and beneficial impact on aquatic life in the Rickreall Creek Basin by significantly reducing the pollutant entering the stream from the effluent outfall. However, removal of the industrial effluent from the creek could have an indirect, short-term, adverse effect on the creek's aquatic lifeforms resulting from reducing the amount of water available to dilute nonpoint source contaminants and water temperature in the stream during the summer months. The impacts to habitat would not be expected to affect sensitive species. The effects on aquatic lifeforms of the proposed displacement of the industrial effluent have not been fully studied because detailed investigations of species utilization instream flow versus habitat availability and nonpoint source pollution in the basin have not been conducted.

Detailed studies of plant and animal species in the project area have not been conducted. Short-term construction impacts could include increased human activity and removal of plants and habitats important to primarily nongame wildlife. While some animals removed from their habitats by construction would be expected to survive in similar habitat nearby, some would perish.

Long-term impacts would include the direct loss of habitat resulting from construction and operation of the treatment plant, construction and maintenance of the industrial effluent storage pond, and probable beneficial alterations of habitats by implementation of industrial effluent irrigation and/or sludge land application options. Because most affected areas (except riparian/undisturbed wetland areas) are developed for agricultural or other relatively intensive uses, the resources are likely to be low quality. Much of the plant loss, for example, would include non-native crop grasses.

Threatened and Endangered Species.

Pursuant to the Endangered Species Act of 1973 (PL 93-205), protection of endangered and threatened species and their critical habitats must be considered in development of the project. However, reconnaissance surveys of portions of the project vicinity suggests that the highly managed character of potentially affected areas probably precludes use of the areas by sensitive species. Plant and animal species and/or their critical habitat potentially subject to this law nonetheless may be present in the project area.

Possible Mitigation Measures

If any instream work is proposed, the project should comply with the July 1 to October 1 in-water work restriction schedule for Rickreall and Ash Creeks designated by ODFW. If construction staging would not permit compliance with this schedule, the ODFW should be consulted to determine if the schedule can be modified. In some special situations, localized conditions may permit some flexibility in the in-water work restriction schedule, particularly at either end of the period. Localized conditions may include the actual absence of fish and/or important streambed habitats in or near construction areas. Generating data required for indicating special conditions may require stream habitat and fish use surveys, and development of a detailed erosion control plan. It may be more feasible to direction drill affected streams rather than conduct the additional studies.

The ODFW and USFWS should be consulted to determine the industrial effects of industrial effluent irrigation and sludge land application on sensitive species and habitats.

Cultural Resources

Prehistoric or historic archaeological or built sites have not been recorded in the affected areas. Portions of the project area are in locations that have a relatively high probability of containing archaeological resources. Short-term adverse impacts to cultural resources could include their alternation or destruction by construction activities. Because of the importance of maintaining the context of cultural resources, short-term impacts would, in effect, result in long-term impacts to the resource base.

Possible Mitigation Measures

A cultural resource survey should be conducted of the project areas as soon as possible. This would include surveys to identify historic and prehistoric archaeological resources and historic built resources that might be located in the impacted areas associated with the treatment plant expansion, pipelines, and effluent irrigation and/or sludge land application sites. The permitting and methodological procedures of the survey should comply with ORS 390.235, 36 CFR 800 and its implementing guidelines, including the Secretary of Interior's Archaeology and Historic Preservation Standards and Guidelines (FR Vol. 48, No. 190:44716-44742). This would include consultations with native American representatives, a survey of the affected areas, potential testing and/or data recovery excavations of discovered archaeological resources, recordation of historic built environment features, and documentation of results.

Property Access

Construction of the proposed facilities is expected to temporarily affect access to residences and road intersections. Duration of access limitations is not expected to exceed more than 5 days at any one location.

Possible Mitigation Measures

The specifications for the construction contractor should include provisions to minimize the duration of all access limitations at residential, commercial, and industrial properties, or any other access which provides the only feasible access to a property. This could include specifying daily construction schedules that require excavations to occur only during periods when access is not required and otherwise permit access via temporary covers over excavations, or construction of additional temporary access points.

Water Rights

Short-term displacement of some water (i.e., the industrial effluent) from Rickreall Creek resulting from use of the recommended option could affect water use downstream from the current outfall on the creek. As previously discussed, these reductions in water availability downstream from the WWTF are likely to be offset in the long-term by increased discharge of treated domestic effluent generated by an increased service population. State law permits the City to use and displace municipal water as needed, provided the ODFW is consulted about the effects of water use on fish and wildlife, and the use is beneficial. The City's water rights predate other water rights as explained in Chapter 7. The ODFW has been involved in the project through consultations with project planners, biologists, managers, and the DEQ. The use of industrial effluent for irrigation of poplar trees on agricultural properties would be a beneficial use of the water.

Water use in the Rickreall Creek Basin is a long-standing complex of issues that is expected to become more severe with additional development that will place additional demands on the limited water quantities available. However, the complex of issues is beyond the scope of this study, which is in response to the rigorous SFO schedule.

Implementation Considerations

Elements of the recommended wastewater system improvements described previously must be implemented to improve the water quality of Rickreall Creek. The DEQ has established a compliance schedule as outlined in the Stipulation and Final Order (see Appendix B), to implement the necessary improvements and meet the new water quality standards. The purpose of this section is to identify activities necessary to implement the recommended improvements, estimate the duration of these activities, and define a recommended implementation program to comply with the intent of the DEQ compliance order.

Basic Implementation Steps

Most components of the recommended improvements require construction and therefore have some common implementation steps that must be followed to complete the work. These basic steps include:

- **Site selection, acquisition, and/or permitting.** This step involves the activities to acquire land, easements, and/or permits to allow design and construction of the improvements. Activities can include additional site evaluations, expanded environmental studies, surveys, negotiations with property owners, consultations with land use and regulatory agency officials and the public, and preparation, submittal, and tracking of land use and construction related permits.
- **Improvement design.** This step involves the preparation of design drawings, specifications, and contracts that describe the scope of the improvements to be constructed. Designs must comply with industry standards, building codes, safety requirements, permits, and other standards. Designs are typically subject to review and approval by local, state, and/or federal agencies.
- **Construction bidding.** This step involves the activities to solicit bids from interested contractors to construct the project. The bidding process for public projects is regulated by state and federal standards and includes preparation of bid documents, bid advertisements, design clarifications, evaluating bids, and ultimately selecting a construction contractor.
- **Improvement construction.** This step involves the actual construction of the improvements by the construction contractor. The construction work is completed in accordance with the design drawings and specifications and is typically monitored by the design engineer, owner, and permitting and regulatory agencies.

Critical Implementation Elements, Activities, and Durations

The wastewater treatment plant upgrade, which is the largest element of the recommended improvement program in terms of technological complexity and cost, will be the most time-consuming to implement and therefore is the critical component of the recommended wastewater management program. The nature of implementation steps and the duration of these steps for the treatment plant will dictate the overall compliance date for the program. Other elements of the program, such as the collection system improvements, are also very important to the overall program, but will not require the longer implementation period required by the new treatment plant. The implementation steps, estimated duration, and proposed overall schedule for implementing the treatment plant upgrade are discussed below.

Site Selection, Acquisition, and Permitting

Additional field studies and surveys such as wetlands, sensitive species or habitat, and archaeological may be necessary. Acquisition through purchase at fair market value or easements will be a critical step in the process. If willing owners are not located, then the City could exercise their right of condemnation to acquire the property.

Treatment Plant Design

Design of the new treatment facilities could begin after final approval of the facility plan. The initial design work would include site property and topographic surveys and geotechnical investigations. Final design would use this information to prepare detailed design drawings, technical specifications, and construction contract documents for the recommended treatment facilities.

The schedule as outlined in the SFO allows 10 months from the time of facility plan approval for design, which is a reasonable period to complete this level of design. The schedule allows an additional 2 months for DEQ review of the design and final design revisions.

Construction Bidding

State law dictates minimum bid periods for public works projects. For a project of this complexity and cost, a 6- to 8-week bid period is appropriate. An additional 6- to 8-weeks is typically required to compile and analyze bids, recommend and process contract award, and execute a construction contract with the responsible low bidder. Overall, the bid period will be about 4 months.

Treatment Plant Construction

By nature, treatment plant construction involves excavation and concrete work for the majority of the treatment processes and also requires complex mechanical- and electrical-related construction. In addition, the new treatment facilities require specially designed process equipment made for each application, which can involve long lead times, up to 1 year, for manufacture and testing. Several months will also be required at the end of construction for startup and operational testing of the treatment processes. Overall wastewater treatment plant construction is much more complex and requires longer durations than other types of construction.

Based on the scope, complexity, and estimated cost of the recommended wastewater treatment and disposal system improvements, a minimum construction duration of 2 years is considered necessary and typical for projects of this magnitude. A construction period shorter than this duration would require construction activities to be abnormally compressed and accelerated, which would increase the total cost. As defined in the SFO, a construction period of 30 months from the time of DEQ approval of the plans and specifications has been defined for this project. This will allow the 4 months for bid and award, 24 months for construction, and 2 months for startup.

Sequencing of Improvements

Implementation of certain elements of the recommended program must be considered separately from those of the main treatment plant upgrade because of special circumstances. These elements are:

- Separate irrigation using industrial wastewater
- Supplemental characterization of influent and effluent and performance verification
- Additional improvements to meet water quality criteria if required

Because of the logical relationship between these components and the treatment plant upgrade, they must be implemented in a specific sequence. Pilot testing must first be performed to establish reliable design criteria for poplar irrigation using the industrial wastewater. This could occur simultaneously with the design of treatment plant improvements. The actual design and construction of the industrial poplar irrigation site would occur at a later date, after an analysis of the pilot testing data. Similarly, supplemental characterization and performance verification must be performed after the confirmed required treatment plant improvements and industrial poplar irrigation are constructed and online. Design and construction of additional improvements, if any, would follow after this. This sequence helps ensure that expensive treatment components will not be added unless they are required based on reliable testing data. Further details of this "phased" implementation are provided in Chapter 10.

Schedule

The previous sections briefly describe the implementation steps to construct the wastewater treatment facility improvements and the estimated duration of these steps. Figure 9-3 shows a composite schedule for these basic implementation steps for the treatment plant upgrade and some collection system improvements. The schedule in Figure 9-3 only includes components to be implemented in Phase 1 as described in Chapter 10. Industrial poplar irrigation, testing, and any subsequent improvements following testing are not included in this schedule. The duration that is anticipated before the treatment facility would be operational is a minimum of 42 months following approval of this facilities plan. If unforeseen conditions or circumstances should occur, this duration could be longer.

The final completion date is dependent on the date of approval of this facility plan and approval of the design documents that will be prepared. The current approved schedule is to submit a final facility plan to DEQ in April 1996 that incorporates all public and DEQ review comments. Allowing 6 months for DEQ final review would result in a final approval in October 1996. Adding 42 months to this date results in a target completion in April 2000.

PROGRAM ACTIVITY	START DATE	FINISH DATE	DURATION MONTHS
FACILITY PLAN AMENDMENT PHASE	1-Jun-95	1-Apr-96	10
DEQ FACILITY PLAN REVIEW & APPROVAL	2-Apr-96	1-Aug-96	4
DESIGN PHASE AND SITE ACQUISITION	1-Jun-96	31-Mar-97	10
DEQ DESIGN REVIEW & APPROVAL	1-Apr-97	30-Apr-97	1
BID & AWARD PHASE	1-May-97	30-Jul-97	3
CONSTRUCTION PHASE	1-Aug-97	31-Jul-99	24
STARTUP & OPERATIONS PHASE	1-Aug-99	31-Oct-99	3

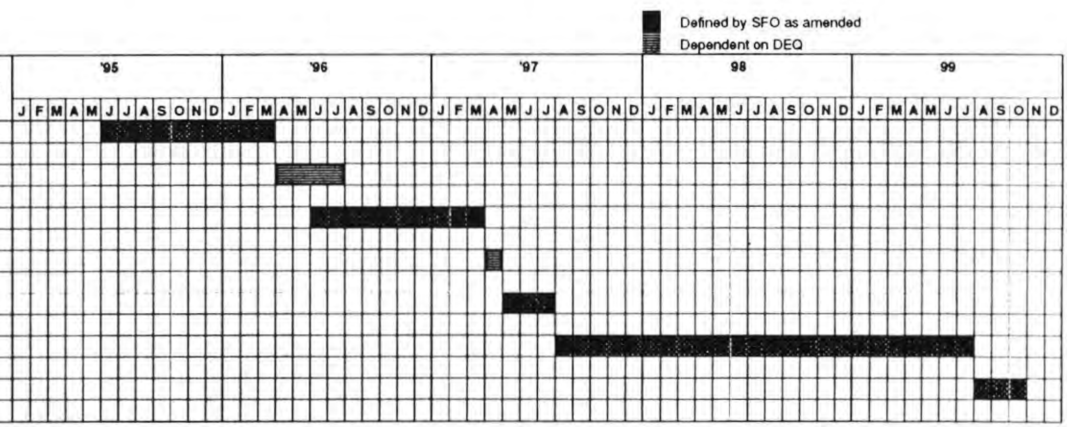

Figure 9-3
Dalles, Oregon
Wastewater Program
Plan Schedule

Financial Considerations

A key consideration in developing the Wastewater Facility Plan involves determining how the recommended wastewater system improvements plan will be funded and projecting the resulting impact on the City of Dallas' financial operations and on the City sewer customers. A financial analysis considering the improvements recommended in the facility plan has been prepared to address these issues. The financial plan is discussed in Chapter 10.

The financial plan considers both capital and operating costs, along with financing costs associated with debt obligations issued to fund elements of the capital program. The plan considers alternative methods for financing the improvements.

The financing alternatives are designed to accommodate the capital needs of the sewer fund and the facility plan. Facilities plan capital requirements place a substantial burden on the City in the early years of the program and will necessitate the need to borrow funds for repayment over time. The success of the financing plan is linked to the City's ability to raise sewer rates in a regular and timely manner. Each of the plan alternatives attempts to defer the full impacts of the financing requirements for as long as possible, thus allowing sewer rates to be increased less dramatically than what would otherwise be required. The financing alternatives attempt to balance the need to minimize rate increases and impacts with the need to maintain strong financial operating results, a key in gaining access to the capital markets at a reasonable cost.

Regardless of which alternative is chosen by the City, sewer rates and charges will need to be increased. To ensure that cost impacts to users are minimized, the following factors should be considered as the plan is implemented:

- Apply value engineering analysis where appropriate to ensure that the most cost-effective designs are being implemented.
- Monitor credit market conditions and time the issue of debt obligations to achieve the lowest possible borrowing costs.
- Consider the impacts of additional increases in the system development charges (SDC), within the limitations imposed by state law, to ensure that new customers pay an equitable share of facility costs.
- Pursue funding from the State Revolving Fund as a way to reduce overall borrowing costs.
- Consider undertaking a formal rate study to ensure that the cost allocation framework continues to recover costs proportionately from all system customers.
- Commence financial plan implementation as soon as possible to ensure that all financing issues can be resolved and that needed financing can take place in a timely manner.

Chapter 10
Facility Financial Plan, Implementation, and Recommendations

CHAPTER 10

FACILITY FINANCIAL PLAN, IMPLEMENTATION, AND RECOMMENDATIONS

Introduction

The City's success in implementing the wastewater management program described in this wastewater facility plan is dependent upon its ability to generate sufficient cash flow from the operation of its system and to secure stable, long-term loan financing or other financial assistance.

This chapter discusses the plan for financing the wastewater management program. Projections are provided for City revenues and expenses, capital costs, and debt service. Various financing resources and tools are discussed. The City's current and future financing capacity is determined and used to evaluate methods of financing the program. Two options for program implementation are presented and evaluated. These include immediate, short-term implementation of the recommended plan and a prioritized, phased alternative plan.

For the phased implementation plan, two plans are presented. The Preferred Implementation Plan assumes total project costs of $26.6 million in 1995 dollars. The Modified Implementation Plan assumes total project costs of $31.5 million in 1995 dollars.

The sections of this chapter are organized as follows:

- Resources
- Financial Capacity Under Immediate Implementation Option
- Alternative Phasing Approaches
- Recommended Financial Plan for Alternative Phasing of Preferred Implementation Plan
- Recommended Financial Plan for Alternative Phasing of Modified Implementation Plan
- Conclusion

Resources

Resources available to the City include internally generated funds through the operation of its wastewater system, and state and federal loan and grant programs.

Operating Results

Revenues

The City's primary resource for all wastewater operating and capital expenditures is revenue generated through rates and charges. The rates for users by customer class shown in Table 10-1 were recently adopted by the City Council and were effective February 1, 1996.

In addition to regular sewer rates and charges, the City charges Systems Development Charges (SDCs) to new users of the system. The SDC is currently $2,000 per dwelling unit.

Table 10-1
Sewer Rates by Customer Class

Customer Class	Minimum Charge ($/mo)	Base Charge ($/mo)	Volume Charges ($100/cf)
Single family	$27.00		
Multi-family	$19.90		
Commercial	$27.00	$0.00	300 cf or less
Commercial	$27.00	$24.50	$1.50 between 300 cf and 5,000 cf
Commercial	$27.00	$24.50	$1.10 between 5,000 cf and 10,000 cf
Commercial	$27.00	$24.50	$0.90 between 10,000 cf and 20,000 cf
Commercial	$27.00	$24.50	$0.60 in excess of 20,000 cf
Industrial	$1,305.00		$0.60 in excess of 100,000 cf

Note: Commercial accounts must pay the greater of: 1) the minimum charge, or 2) a base charge plus volume charge

The City's first priority of revenue expenditure is to pay the operating and maintenance costs of the system. For the purposes of this financial plan, total revenues less operating and maintenance expenses are defined as "net revenues." Table 10-2 shows historical operating results from FY ending 1990 through FY ending 1995 and estimated operating results for FY ending 1996.

Projected Rates and Charges

The City has undertaken a program of increasing its sewer rates and charges in anticipation of the increased operating and capital costs associated with implementation of the new wastewater management program. Table 10-3 shows a projection of sewer rates and charges through FY ending 2000.

The City also proposes to increase SDCs by $500 each year until FY ending 2002. Thereafter, SDCs would increase at 4 percent annually.

Net Revenues

As stated earlier, net revenues are equal to total revenues less operation and maintenance expenses. Net revenues are generally available to pay capital costs on either a pay-as-you-go basis or as debt service. It is assumed that for large capital projects such as this wastewater management program, the City would use net revenues primarily for debt service. In addition to net revenues from the system, the City intends to allocate 50 percent of SDC revenues to the project to pay for debt service.

Table 10-2
Historical Operating Results

Fiscal Year Ending	Historical 1990	1991	1992	1993	1994	1995	Estimated 1996
Beginning fund balance	$193,721	$284,179	$261,058	$277,626	$404,339	$743,917	$1,294,609
Revenues							
Charges for service	467,602	490,417	511,302	637,979	849,371	1,162,851	1,371,564
Other revenues[a]	24,878	23,188	21,206	21,766	27,369	34,214	59,106
Total revenues	492,480	513,605	532,508	659,745	876,740	1,197,065	1,430,670
Expenditures							
Operating expenses	377,291	489,571	504,130	712,214	615,169	559,134	724,546
Net revenues	115,189	24,034	28,378	(52,469)	261,571	637,931	706,124
DEQ loan deposit				186,878	113,122		
Debt service	21,785	25,638	6,147	0	30,000	76,000	91,333
Capital outlays	2,946	21,517	5,663	7,696	5,115	11,239	13,500
Transfer to Street Fund							52,232
DEQ Facility Plan Loan Reserve							91,333
Remaining balance	90,458	(23,121)	16,568	126,713	339,578	550,692	457,726
Ending fund balance	$284,179	$261,058	$277,626	$404,339	$743,917	$1,294,609	$1,752,335

[a] Beginning in 1996, other revenues include: materials sales, overhead charges, hookup fees, and interest earnings.

Table 10-3
Projected Sewer Rates and Charges

Fiscal Year Ending	1997	1998	1999	2000
Sewer rates and charges	$1,651,086	$1,872,851	$2,103,719	$2,343,531
Percentage increase in revenue	20%	13%	12%	11%
Percentage increase in rates	11%	10%	9%	8%
Single family dwelling rate	$30.00	$33.00	$36.00	$39.00

To determine the net revenues available for debt service, the City has undertaken a projection of revenues from rates and charges, operation and maintenance expenses, and SDC revenues through FY ending 2008.

Table 10-4 shows the projections and calculation of net revenues available for debt service to FY ending 2000. These projections are dependent on the outcome of the assumptions used. Actual outcomes will vary from these assumptions and the variance could be material.

Table 10-4 Projected Net Revenues					
Fiscal Year Ending	1996	1997	1998	1999	2000
Revenues					
Charges for service	$1,371,656	$1,651,086	$1,872,851	$2,103,719	$2,343,531
Other revenues	59,106	80,313	70,525	28,534	34,458
Total revenues	1,430,762	1,731,399	1,943,376	2,132,253	2,377,989
Expenditures					
Operating expenses	724,546	753,528	783,669	815,016	1,120,608
Net Revenues	706,216	977,871	1,159,707	1,317,237	1,257,381
Plus transfer from SDC Fund[a]	120,000	125,000	150,000	175,000	200,000
Net Revenues Available for Debt Service	$826,216	$1,102,871	$1,309,707	$1,492,237	$1,457,381

[a]50% of total projected SDC revenues.

Grants

Additional resources may be available to the City in the form of state and federal grants. As described below, each grant program has specific eligibility criteria.

Community Development Block Grant Program

This program is administered by the U.S. Department of Housing and Urban Development and provides grants of up to $750,000 to local governments that can be used for infrastructure improvements such as the City's wastewater management program. Eligibility for the program requires that 51 percent of a jurisdiction's population must be categorized as low or moderate income. The 1990 census showed that 42.9 percent of the City's population was in this category; on that basis, the City would not be eligible for grant funding under this program. Rules allow for an updated count to be undertaken by Portland State University to determine if the City is now eligible. The City has undertaken this update and the results of the study showed that 50.1 percent of the population was categorized as low or moderate income; therefore, the City is currently ineligible for this grant program.

Rural Economic and Community Development Administration (RECD) Grants

Grants administered by the Rural Economic and Community Development Administration (formerly The Farmers Home Administration) are available to cities having under 10,000 in population. The City's population was below 10,000 based on the 1990 census; therefore, the City may be eligible for this program. The City has a pending application with RECD.

Oregon Economic Development Department Grants

The Oregon Economic Development Department (OEDD) administers the Special Public Works Fund Program (SPWF) and the Water/Wastewater Financing Program (WWF). Under the SPWF program, municipal entities may borrow up to $10 million through a combination of loans and grants for projects that develop infrastructure system capacity to stimulate economic development and create jobs. Under the WWF program, municipal entities may borrow up to $10 million to assist in the compliance with federal and state water quality statutes and standards. Grants of up to $500,000 may be provided in conjunction with a loan from OEDD. The City has contacted OEDD about this wastewater facility plan.

Loans/Debt Financing

City-Issued Bonds

The City is authorized under both its charter and state law to issue tax-exempt bonds. Bonds used by cities to support this type of capital program include revenue bonds and general obligation bonds, which are described below.

Revenue Bonds. Revenue bonds are secured by the net revenues of an enterprise system. In the City's case, it would pledge to repay the annual debt service for the bonds with the cash flow resulting from operation of the wastewater system. To ensure reasonable interest rates, issuers are required to generate net revenues equal to annual debt service plus an additional amount referred to as "debt service coverage." The industry standard for coverage is currently approximately 25 percent of debt service. Under the current interest rate environment, the interest rate on 20-year revenue bonds is approximately 5.8 percent. There will be additional costs of issuance and fees to market the bonds. Revenue bonds can be issued without approval of the electors, but they are subject to a 60-day notice period during which the issue may be referred to the voters if sufficient signatures are collected. The City intends to use other financing mechanisms first (such as obtaining loans through the SRF program, RECD and OEDD) since they are more cost-effective than city-issued revenue bonds.

General Obligation Bonds. General obligation bonds secured by a tax levy on real property may be issued for capital construction. Under the current market environment, the interest rate on 20-year general obligation bonds is approximately 5.6 percent. There will also be other costs of issuance. Voter approval is required for the issuance of general obligation bonds.

Other Loan and Bond Programs

State Revolving Fund (SRF). The SRF Loan Program is administered by the Oregon Department of Environmental Quality (DEQ). SRF loans are made to eligible local governments for environmental projects such as the City's wastewater management program. Federal funds and other moneys are pooled to allow for a subsidy of the interest rates paid by local governments. Currently, program rules allow participants such as the City to borrow a maximum of 15 percent of the available pool of funds in a given year. The current interest rate on SRF loans is 4 percent. A loan fee equal to 1.5 percent of the loan is charged at the time of the borrowing. In addition, a service fee which equals 0.5 percent of the outstanding loan balance is charged annually. Debt service coverage can be flexible depending on the level of debt service reserve fund. The City has applied to the program and has received loan allocations to participate in the program.

Rural Economic and Community Development Administration (RECD). RECD (formerly the Farmers Home Administration) administers a loan program. The program charges three different levels of interest rates depending on median household income. The Intermediate Rate is available to communities whose median household income in 1990 was between $22,205 and $27,776. The City of Dallas' median household income was $23,301 in 1990; therefore, the City may be eligible to receive a loan from RECD at an Intermediate Rate, which is currently 5 percent. RECD does not provide interim or construction financing. RECD loans will provide permanent financing once the project has been completed. Because the SRF loan charges a lower interest rate, the City prefers to borrow from the SRF program before borrowing from RECD.

Oregon Economic Development Department. As referred to earlier, OEDD administers the Special Public Works Fund Program (SPWF) and the Water/Wastewater Financing Program (WWF). Under the SPWF program, municipal entities may borrow up to $10 million through a combination of loans and grants, for projects that develop infrastructure system capacity to stimulate economic development and create jobs. Under the WWF program, municipal entities may borrow money from the OEDD to assist in the compliance with federal and state water quality statutes and standards. Loans made are required to be secured by the limited general obligation pledge of the City.

OEDD may provide direct loans or bond funded loans to the City. For bonded projects, the State of Oregon issues revenue bonds through the Oregon Bond Bank and uses the bond bank proceeds to provide a portion of the loans issued to program participants. The final interest rate of the bonds is passed through to the borrower. The current interest rate on 20-year bonds issuing through this program is approximately 5.50 percent. For the purpose of this analysis, a 6 percent interest rate is assumed. One advantage of OEDD loans is that in conjunction with the loan, the City may be eligible for a grant of up to $500,000, which could be used to pay for the cost of the borrowing and funding a debt service reserve.

Financial Capacity Under Immediate Implementation Option

The following analysis examines the City's financial capacity to implement the wastewater management program in a single financing at the conclusion of FY ending 1997, using projections of the sewer system's revenues and operation and maintenance expenses, and assumptions regarding other financial factors and circumstances. Resources identified as most appropriate to finance the program include fund balances of the sewer system, a loan through SRF, and a loan through OEDD.

The following analysis shows that sewer rates and charges would be unaffordable if the project is to be funded in a single phase, immediate implementation program.

State Revolving Fund (SRF) Loan Program

The City is eligible to participate in the State Revolving Fund Loan Program (SRF), which is administered through the Department of Environmental Quality (DEQ). Because SRF loans represent the lowest cost of funds, the City has determined that optimum participation is desirable. Attaining SRF loans is the highest priority for the application of sewer net revenues.

The City has made several applications to DEQ for SRF loans. As of June 21, 1995, the City has received a total loan allocation of $7,881,157 for the wastewater management program. During the FY ending 1995, the maximum loan allocation available to any one applicant was approximately $3.2 million. For planning purposes, it is assumed that the City will receive the same allocation for FY ending 1996, and FY ending 1997. The total SRF loan amount the City would be eligible to borrow from SRF at the time of the financing would be approximately $14,420,000. DEQ's actual loan capacity and internal priorities may affect the actual amount available to the City.

Table 10-5 shows the annual debt service requirements if the City borrowed the maximum loan amount possible from the SRF Loan program.

Table 10-5
Determination of SRF Loan Annual Requirements

Maximum loan amount[a]	$14,420,000
Loan interest rate[b]	4.0%
Term	20 years
Annual debt service	$1,061,049
Amount required for debt service coverage (5%)[c]	$53,052
SRF annual service fee	$72,100
SRF Loan Annual Requirements	$1,186,201

[a]Based on current loan allocation of $7,880,000 and projected $3.2 million for FY ending 1996 and FY ending 1997.

[b]Loan interest rate is currently set at 2/3 of the prevailing tax-exempt interest rate. The prevailing rate is approximately 6%, therefore the SRF interest rate is currently 4.0%. For the purpose of this analysis, the current interest rate of 4.0% is assumed, and is subject to change depending on market conditions

[c]Debt service coverage of 1.05 times annual debt service is required on the condition that a debt service reserve of 100% of annual debt service is funded.

To simplify this analysis, it has been assumed that the SRF loan would be implemented in fiscal year 1997. In actuality, SRF loans can only be used to reimburse for expenses incurred; therefore, in all likelihood, the City would need to issue Bond Anticipation Notes to fund the project and obtain the SRF loan to provide permanent financing once the expenses have been incurred.

OEDD Loan

Under the single phase implementation plan, the City would borrow from the OEDD loan program to pay for the balance of the project cost not funded through the SRF loan program.

The City's financing capacity through OEDD is constrained by the annual cash flow produced by operations. OEDD typically requires that net revenues of the system produce 110 percent of the debt service. Table 10-6 shows a determination of the City's maximum capacity to borrow from OEDD under the limitations provided by the projected net revenues shown in Table 10-3. The target year for net revenues is FY ending 1998. As shown, the debt service that can be allocated to the City's maximum SRF loan is subtracted from net revenues prior to the calculation. This is to indicate that these funds are committed to an SRF loan.

Table 10-6 Determination of OEDD Loan Capacity	
Net Revenues available for Debt Service[a]	$1,309,707
Less: amount for SRF Loan Annual Requirements[b]	($1,186,201)
Amount available to pay OEDD debt service	$123,506
Net available for debt service[c]	$112,278
OEDD Loan supported	$1,287,800

[a] See Table 10-4.

[b] See Table 10-5.

[c] Net available for debt service is based on providing a required 1.10 debt service coverage typically required on OEDD loans.

General Obligation Bonds

Measuring the City's capacity to issue general obligation bonds is not possible on an objective basis. These bonds must be approved by the electorate and the City cannot accurately measure the will of its citizens on this matter without actually putting the matter to a vote. Further, the City desires to maintain growth in its property tax levy consistent with inflation and growth in real market value. City property taxes over the past several years have kept pace with inflation; therefore, the City does not foresee any immediate capacity to issue general obligation bonds. However, the City may consider the use of general obligation bonds in a phased implementation approach.

Determining Capacity and Affordability

Table 10-7 shows an assessment of the City's wastewater facility financing capacity for initial full implementation of the planned wastewater management program. As shown, the City cannot generate sufficient resources to pay for the estimated $28.8 million ($26.6 million in 1995 dollars) program cost shown in Chapter 9. The maximum amount available for project construction is $16,960,000, or approximately $11,810,000 less than the amount required for project completion.

Table 10-8 shows a summary of the affordability of increasing rates and charges in an amount sufficient to support the total project requirement. The resource available to the City to pay the unmet requirement identified in Table 10-8 would be the additional borrowing through OEDD.

As shown in Table 10-8, the amount of OEDD loans required to support the unmet requirement totals $11,810,000. The required increase in net revenues to support a loan of this size is $1,133,000, or a 60.5 percent increase in the revenues currently projected for FY ending 1998. A revenue increase of this magnitude would result in a single family dwelling unit rate increase of $17.16, <u>in addition</u> to a planned $3.00 increase in FY ending 1998. Further, the rate increase would be required to take effect July 1, 1997 rather than on February 1, 1998. The sewer rate for FY ending 1998 would be approximately $50.16, which is 125 percent of the rate considered to be affordable by the EPA.

Table 10-7
Assessment of Financing Capacity

	State Revolving Fund Loan[a]	OEDD Loan[d]	Other Funds	Total
Sources				
Maximum loan capacity	$14,420,000			$14,420,000
OEDD Loan		$1,287,800		$1,287,800
Available City funds[b]			2,530,206	$2,530,206
	$14,420,000	$1,287,800	$2,530,206	$18,238,006
Uses				
Project amount[c]	$13,142,651	$1,287,800	$2,530,206	$16,960,657
Reserve fund[d]	$1,061,049	$0		$1,061,049
Issuance Costs[e]	$0	$0		$0
Loan fee[f]	216,300	0	0	$216,300
	$14,420,000	$1,287,800	$2,530,206	$18,238,006
Full Capital Requirement[g]	$28,770,560			
Total project funds available	16,960,657			
Unmet funding requirement	$11,809,903			

[a]See Table 10-5.
[b]Estimated FY ending 1997 ending fund balance minus $200,000.
[c]Amount remaining for project expenditures after borrowing costs and reserves.
[d]Assumes that OEDD grant will pay for required reserve fund for OEDD Loan.
[e]Assumes that OEDD grant will pay for issuance costs for OEDD Loan.
[f]SRF Loan fee of 1.5 percent of loan amount.
[g]Capital cost assumes the Preferred Implementation Plan only, ($26.6 million in 1995 dollars, inflated to FY ending 1997 dollars).

Table 10-8 Affordability Analysis of Monthly Rates	
Unmet funding requirement[a]	$11,809,903
Required OEDD Loan amount[b]	$11,809,903
Required annual debt service	$1,030,000
Required increase in net revenues[c]	$1,133,000
Percentage increase in revenue[d]	60.50%
Estimated increase in rate for single dwelling unit[e]	$17.16
Total single dwelling average unit rate	$50.16
Maximum affordable rate[f]	$40.00

[a]See Table 10-7.

[b]Assumes that reserves and cost of issuance are paid by an OEDD Grant. As a result, all loan proceeds will go toward project.

[c]110 percent of annual debt service.

[d]Increase in revenue over projected 1998 revenue. See Table 10-3.

[e]The required increase in rate added to the projected $33.00 rate shown in Table 10-3.

[f]Equal to 1.5 percent of the 1998 projected median income for the City of Dallas. Source: DEQ.

In the publication *Is Your Proposed Wastewater Project Too Costly?* (see Appendix E), the EPA has found that the maximum affordable rate per household is equal to 1.5 percent of household income. Taking into account the median household income for the City for 1990 which was $23,301, and projecting this amount to FY ending 1998, the maximum affordable rate in FY 1998 would be $40.00. This amount is $10 less than the rate required to immediately implement and finance the entire wastewater management plan. On this basis, the City does not consider immediate, full implementation of the plan to be feasible.

Alternative Phasing Approach

Given that the immediate, full implementation of the wastewater plan is not affordable, an alternative, phased approach is required. Therefore, a phased implementation approach has been developed to achieve an affordable plan for the community.

The recommended improvement program consists of two major components; collection system improvements and treatment system improvements (see Chapter 9 for more details). The treatment system improvements include liquid and solids treatment and disposal components. In an effort to make the plan affordable to implement, the proposed improvements will be phased over time. The component phasing is based on addressing the facilities' deficiencies in a logical manner where the most significant problems are corrected first.

As discussed in Chapter 9, the recommended liquid treatment improvements consists of four major elements:

- An advanced biological treatment plant with tertiary filtration

- A separate industrial effluent disposal system (poplar tree irrigation)
- A testing program to develop design criteria, provide supplemental waste characterization, and verify process performance
- Supplemental improvements (flow augmentation, chemical treatment, or poplar tree irrigation during some months) if testing reveals that the metal toxicity criteria are not met or significant impairment of beneficial uses occurs

As presented in Table 9-11, the program cost for implementing the first three elements of the liquid improvements plus the recommended collection and sludge improvements is estimated to be $26.6 million. If the fourth liquid treatment element is required, then the cost of the program is estimated to be as high as $31.5 million. Because of the limited metals data available, numerous assumptions used in the analysis and modeling efforts, and the option for source reduction through control of dischargers or source water treatment, it is anticipated at this time that the supplemental improvements will not be needed. In addition, the preferred approach ($26.6 million) results in the greatest overall benefits to the environment and affected parties, as discussed in Chapter 9. However, because the final improvements cannot be determined at this time, a Preferred Implementation Plan and a Modified Implementation Plan will be considered. The Preferred Implementation Plan will consider phasing of the $26.6 million program, and the Modified Implementation Plan will consider implementation of the $31.5 million program.

Criteria for Phasing

Because the entire project cannot be financed for immediate completion, criteria were developed to determine which portions of the project should be completed first. The following seven project goals were identified for the upgrade of the WWTF and are discussed in Chapter 2, Existing Conditions:

1. Eliminate wet weather bypassing of untreated sewage
2. Achieve water quality criteria in Rickreall Creek
3. Meet USEPA reliability and redundancy criteria
4. Achieve 85 percent minimum treatment removal of BOD/TSS (wet weather issue)
5. Meet new sludge regulations (40 CFR 257, Part 503)
6. Replace aging facilities
7. Provide treatment capability for future growth

The aim of the phased project approach is to achieve the most important goals and as many of the goals as possible in the first phase. The most important immediate goal was to eliminate the bypassing of untreated sewage to Rickreall Creek. Because the majority of bypasses occur at the existing WWTF influent pump station, most bypasses may be eliminated by the upgrade of the pump station and treatment capacity of the plant and through source reduction. A second important goal is to address water quality concerns in Rickreall Creek. Although not every water quality criteria/guideline may be achieved in the first phase, the construction of a new advanced biological treatment facility will allow the City to meet the dissolved oxygen criteria in Rickreall Creek. Other improvements such as new chlorination/dechlorination facilities will meet bacteria and chlorine toxicity criteria. The improvements to achieve these first two important goals will result in most of the aging facilities being replaced or upgraded. In addition, the new improvements will be designed to meet the Class II reliability and redundancy criteria.

Other goals to be addressed in later phases include the new sludge regulations for beneficial reuse (40 CFR 257, Part 503), the 85 percent minimum treatment of BOD/TSS, and the treatment capacity for future growth. Because the current practice of landfilling stabilized sludge will remain acceptable in the foreseeable future, upgrading facilities to provide the flexibility to meet the new regulations for beneficial reuse is not necessary during the first phase. The addition of filtration in a later phase will allow the WWTF to meet the 85 percent treatment rule; however, as discussed in the following section, meeting the 85 percent criteria at all flow conditions results in effluent limits that are significantly more restrictive than those required to meet the proposed mass-based limits. The phased rehabilitation of the wastewater collection system to reduce infiltration and inflow will also assist in meeting the criteria. The final project goal of providing treatment capability for future growth will be phased over time since growth will occur gradually.

In addition to the regulatory issues presented, there are technical issues that result in the need for phasing and that also impact how the improvements should be sequenced. These are discussed in Chapter 9. A key point is that phasing affords the opportunity to verify detailed design criteria and to collect supplemental data that might prevent investing in facilities that may not be necessary.

85 Percent Removal Criteria

To conform to the 85 percent treatment criteria, filtration of all effluent, up to the wet weather maximum month flow, has been assumed (See Chapter 7 and Appendix C). For a Rickreall Creek discharge, based on the proposed mass loads presented in Table 6-7, filtration facilities designed for the wet weather maximum month flow would not be required. Rather, the filters could be designed for the dry weather maximum month flow. Therefore, the requirement of filtration for maximum month wet weather flows to meet the 85 percent efficiency most of the time would constitute excessive treatment beyond the filtration of dry weather maximum month flows necessary to meet the most critical basin standard condition. During most of the year, the 85 percent removal criteria can be consistently met. However, during some high flow wet weather months, the 85 percent removal criteria cannot be met due to the dilute nature of the influent wastewater.

The cost of filtration comprises a significant portion of the total liquid treatment capital and O&M costs. The cost of filtration is estimated at $1.5 million, or 12 percent of the total liquid treatment capital cost of $12.4 million. O&M costs are estimated at $75,000 per year, or 12 percent of the total liquid treatment O&M cost of $620,000 per year.

As stated in Chapter 6, the federal regulations (40 CFR, Part 133) contain special considerations for a lower percent removal requirement, which the WWTF will meet. One special consideration is for treatment facilities with less concentrated influent wastewater for a collection system with separated sewers. A lower percent removal requirement may be granted if the following is demonstrated:

1. *The treatment facility is consistently meeting, or will consistently meet, its permit effluent concentration limits, but its percent removal requirements cannot be met due to less concentrated influent wastewater.*

As shown in Chapter 2, the current Dallas WWTF has a less concentrated influent wastewater, especially during the winter.

2. *To meet the percent removal requirements, the treatment facility would have to achieve significantly more stringent limitations than would otherwise be required by the concentration-based standards.*

   Given the proposed mass loads for Rickreall Creek, filtration would need to be designed for the DWMMADF. Meeting the 85 percent removal requirement would require a design based on the WWMMADF, which results in more stringent effluent limitations than would be required by the mass-based limits. The potential capital investment savings is estimated to be $500,000.

3. *The less concentrated influent wastewater is not the result of excessive I/I. Excessive I/I is defined as the quantities of infiltration/inflow that can be economically eliminated from a sewer system as determined in a cost-effectiveness analysis that compares the costs for correcting the infiltration/ inflow conditions to the total costs for transportation and treatment of the infiltration/inflow. Also, to further demonstrate that inflow is nonexcessive, total average flow to the plant must be less than 275 gallons per capita per day.*

   Future projected influent wastewater quality is also expected to be less concentrated, as shown in Chapter 3, even after the sewer rehabilitation work recommended by the cost-effectiveness analysis in Chapter 5.

Given that the Dallas WWTF meets the requirements to be granted a lower percent removal requirement, a tiered percent removal requirement is proposed.

During the dry weather season, 85 percent removal of BOD/TSS can be achieved at all monthly average flows up to the design DWMMADF of 3.07 mgd. During the wet weather season, a tiered approach is proposed. Figure 10-1 shows historical winter monthly average flows and corresponding influent WWTF BOD. It is assumed that a 10 mg/L monthly average effluent concentration of BOD/TSS can be achieved at all flows up to the design WWMMADF of 7.39 mgd. Therefore, a monthly average of 85 percent removal can be achieved at winter monthly average flows where the influent BOD concentration is greater than 67 mg/L. Given the historical data in Figure 10-1, flows less than 2.0 mgd should have influent BOD concentrations of greater than 67 mg/L. Flows between 2.0 and 3.0 mgd should have influent BOD concentrations of greater than 40 mg/L. Between 2.0 and 3.0 mgd, 75 percent removal can be achieved. Flows greater than 3.0 mgd should have influent BOD concentrations of greater than 30 mg/L. At greater than 3.0 mgd, 65 percent removal can be achieved.

As the I/I removal program progresses and growth occurs, winter influent wastewater should become gradually less dilute, which may allow the percent removal targets to be adjusted to match the capability of the WWTF.

Preferred Implementation Plan

Improvements at the WWTF will be constructed in three phases. Phase 1 implementation will follow the schedule as presented in Figure 9-5, with facility operation in mid-1999. Phase 2 construction is projected to begin in 2002 with operation in 2003. The Phase 3 facilities are anticipated to be operational by the year 2007, although the rate of growth will

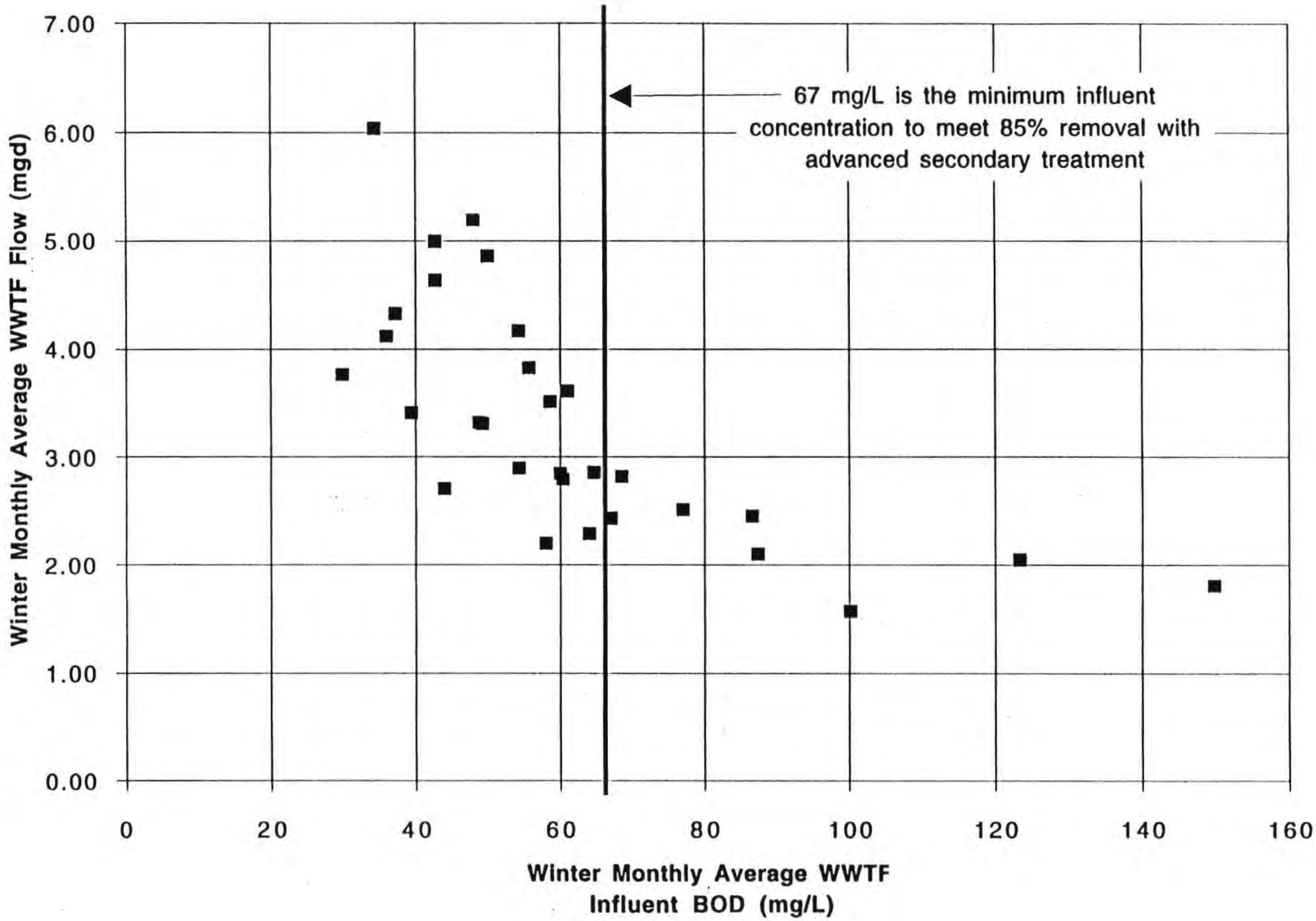

Figure 10-1
MONTHLY AVERAGE WWTF FLOW VERSUS MONTHLY AVERAGE INFLUENT BOD

determine when Phase 3 will actually be needed. The components of the three phases are described below. Process flow diagrams for the liquid and solids treatment improvements are shown in Figures 10-2 and 10-3, respectively. The phased capital and O&M costs for the preferred implementation plan are presented in Tables 10-9 and 10-10.

Table 10-10
Preferred Implementation Approach
Estimated Total Annual Sewer O&M Costs

Components	Labor	Power	Chemicals	Maintenance	Miscellaneous	Total
Phase 1						
Administration and Engineering	0.09				0.18	0.27
Maintenance - Collection/Stormwater	0.09	0.01	0	0.08		0.18
Treatment Plant	0.14	0.11	0.10	0.11	0.02	0.48
Total	**0.32**	**0.12**	**0.10**	**0.19**	**0.20**	**0.93**
Phase 2						
Components	**Labor**	**Power**	**Chemicals**	**Maintenance**	**Miscellaneous**	**Total**
Administration and Engineering	0.09				0.18	0.27
Maintenance - Collection/Stormwater	0.09	0.01	0	0.08		0.18
Treatment Plant	0.17	0.11	0.10	0.12	0.02	0.52
Total	**0.35**	**0.12**	**0.10**	**0.20**	**0.20**	**0.97**
Phase 3						
Components	**Labor**	**Power**	**Chemicals**	**Maintenance**	**Miscellaneous**	**Total**
Administration and Engineering	0.09				0.18	0.27
Maintenance - Collection/Stormwater	0.09	0.01	0	0.08		0.18
Treatment Plant	0.22	0.15	0.19	0.15	0.02	0.73
Total	**0.40**	**0.16**	**0.19**	**0.23**	**0.20**	**1.18**

Phase 1

Collection system improvements included in Phase 1 are interceptor relief sewers and source reduction repairs. Phase 1 liquid treatment facilities will include a new influent pump station, new influent screens, three new advanced biological aeration basins, two new secondary clarifiers, new disinfection basins and dechlorination facilities, new post aeration basin, and new outfall into Rickreall Creek. Phase 1 solids treatment facilities will include a new sludge pumping station and humus pond improvements. Land required for Phase 2 would be purchased during this phase. Also during this phase, the City will perform testing to establish design criteria for the industrial effluent poplar tree irrigation system. The projected expenditure timeline for Phase 1 of the preferred implementation approach is shown in Table 10-11.

By providing peak flow pumping capability and collection system upgrades and repairs, the Phase 1 improvements will minimize bypasses of untreated sewage to Rickreall Creek. The Phase 1 facilities will also address the water quality criteria concerns of dissolved oxygen, bacteria, and chlorine toxicity. Thus, the two most important immediate goals for wastewater improvements will be achieved. USEPA reliability and redundancy criteria will also be met for the new facilities during Phase 1.

Phase 2

Phase 2 will consist of implementation of a separate industrial effluent poplar tree irrigation system and continued collection system source reduction. The improvements will include a storage pond, irrigation pump station, irrigation distribution system, and poplar trees. At this time, no other treatment facilities are anticipated for the industrial effluent. During

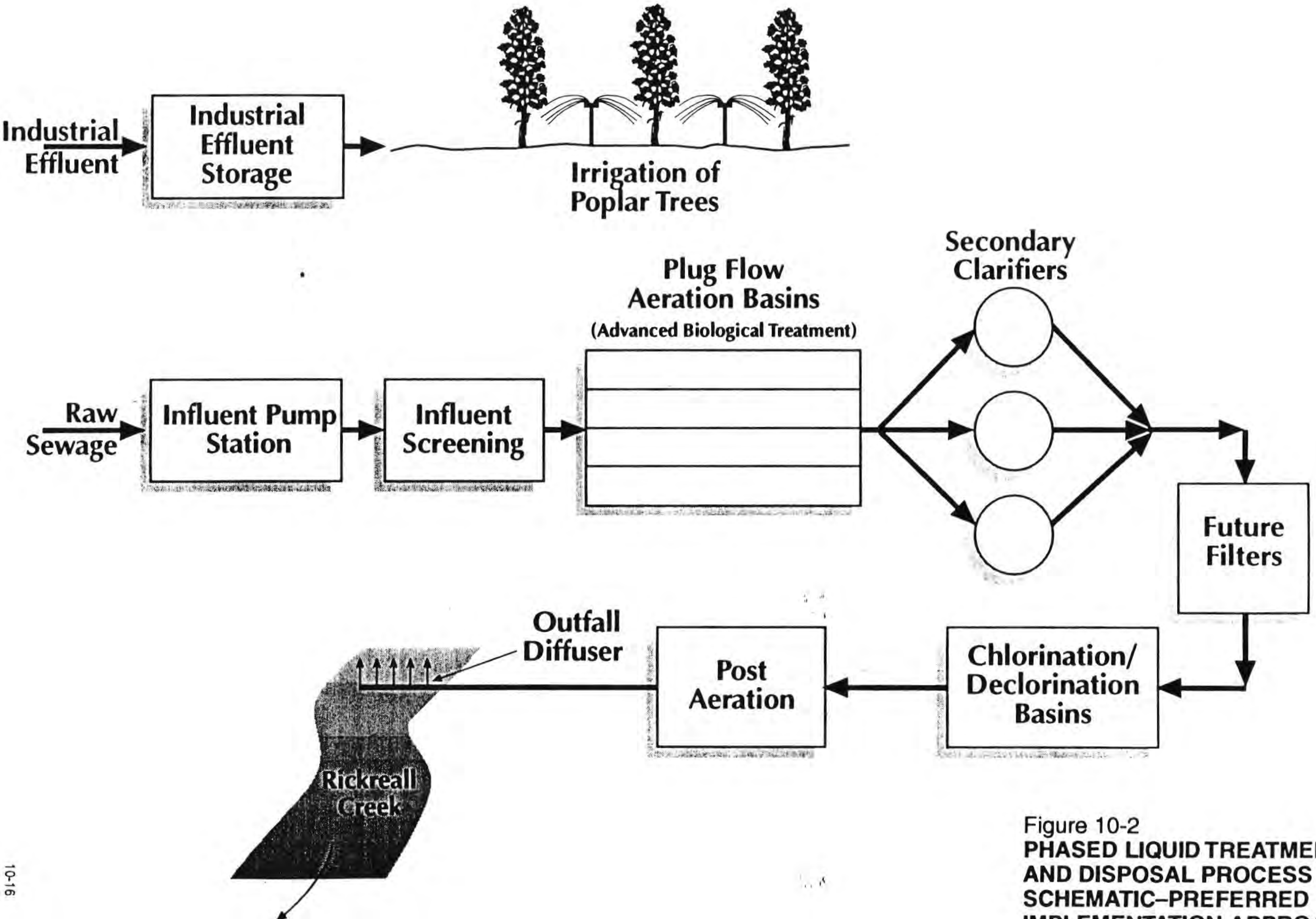

Figure 10-2
PHASED LIQUID TREATMENT AND DISPOSAL PROCESS SCHEMATIC–PREFERRED IMPLEMENTATION APPROACH

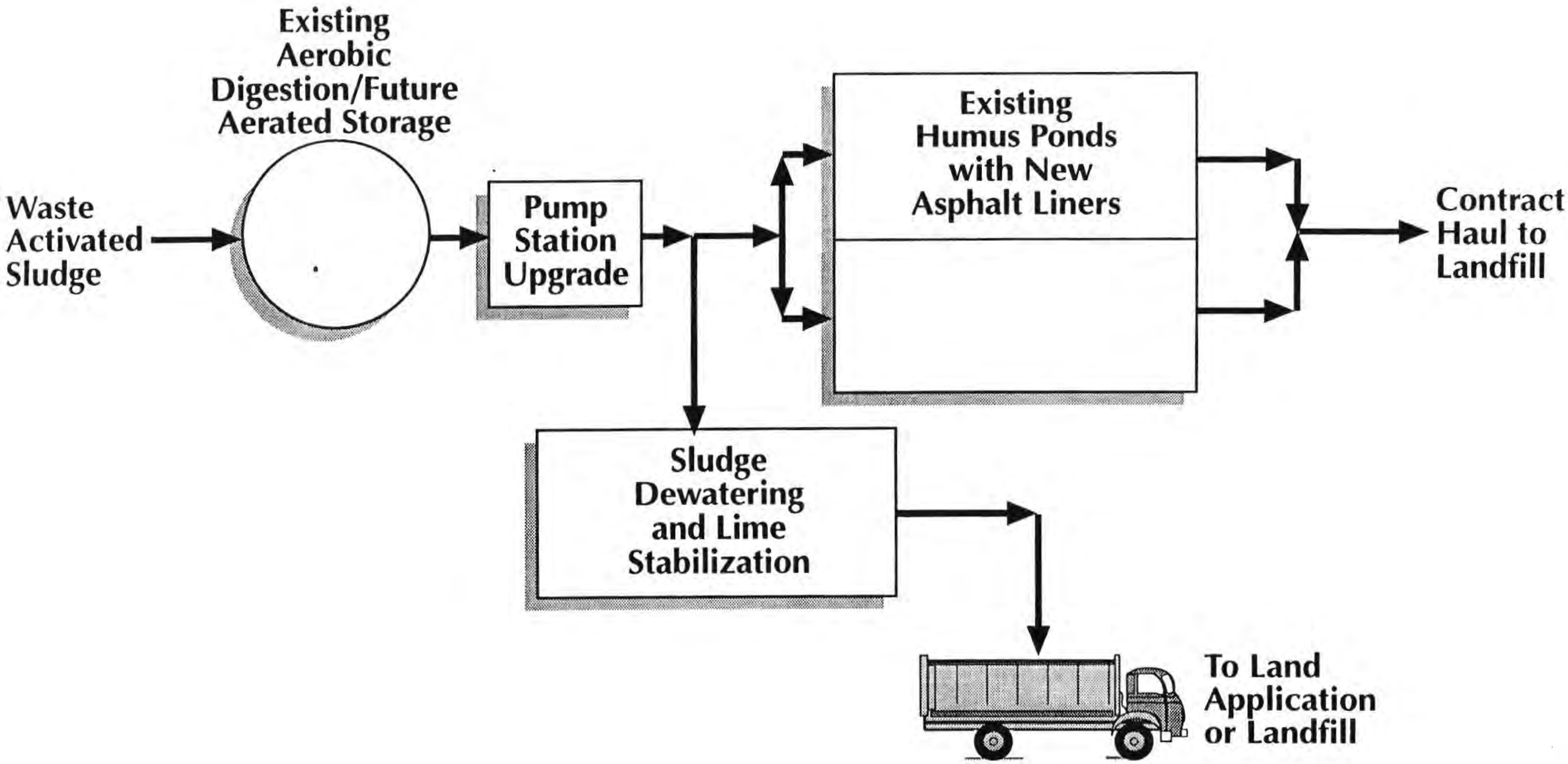

Figure 10-3
PHASED SLUDGE STABILIZATION AND DISPOSAL PROCESS SCHEMATIC – PREFERRED IMPLEMENTATION APPROACH

Table 10-9
Preferred Implementation Approach
Phased Capital Cost Estimates (1995 $, Millions)

System Component	Phase 1	Phase 2	Phase 3
Collection System			
Ash Creek Interceptor	0.0	0.0	1.2
LaCreole Relief Sewer	0.7	0.0	0.0
Source Reduction	1.0	1.2	1.5
Collection Subtotal	**1.7**	**1.2**	**2.7**
Liquid Treatment			
Operations and Control Building	0.6	0.0	0.0
Influent Pumping	1.6	0.0	0.0
Headworks	0.6	0.0	0.0
Aeration	2.9	0.0	0.9
Secondary Clarification	1.9	0.0	1.0
Filtration	0.0	0.0	1.5
Tertiary Clarification	0.0	0.0	0.0
Disinfection/Dechlorination	1.0	0.0	0.0
Wetlands	0.0	0.0	0.0
Wetlands Land	0.0	0.0	0.0
Reaeration	0.4	0.0	0.0
Intermediate Pumping	0.0	0.0	0.0
Liquid Treatment Subtotal	**9.0**	**0.0**	**3.4**
Liquid Disposal			
WWTP Effluent Storage	0.0	0.0	0.0
WWTP Effluent Pumping	0.0	0.0	0.0
WWTP Pipeline/Distribution	0.0	0.0	0.0
WWTP Irrigation Site Land	0.0	0.0	0.0
Industry Effluent Storage	0.0	1.5	0.0
Industry Effluent Pumping	0.0	0.1	0.0
Industry Pipeline/Distribution	0.0	1.1	0.0
Industry Irrigation Site Land	0.2	0.0	0.0
Outfall	0.2	0.0	0.0
Liquid Disposal Subtotal	**0.4**	**2.7**	**0.0**
Solids Treatment/Disposal			
Humus Pond Imrpovements	0.3	0.0	0.0
Dewatering and Lime Stabilization	0.0	0.0	1.7
Solids Subtotal	**0.3**	**0.0**	**1.7**
Engineering, Legal, & Admin.	**2.2**	**0.4**	**0.9**
Total Phased Capital Cost	**13.6**	**4.3**	**8.7**

Table 10-11
Preferred Implementation Approach
Projected Capital Cost Expenditures by Fiscal Year[a]
(1995 $, Millions)

Improvements	Totals	Fiscal Years 1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Collection System														
Interceptors	1.9				0.4	0.3							0.6	0.6
Source Reduction[b]	3.7	0.1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Treatment System														
Liquids	15.5			4.1	4.1	1.2			1.4	1.3			2.1	1.3
Solids	2.0					0.3							1.0	0.7
Engineering, Legal, and Administration	3.5		0.9	0.5	0.5	0.3		0.1	0.2	0.1		0.3	0.3	0.3
Total Capital Cost	**26.6**	**0.1**	**1.2**	**4.9**	**5.3**	**2.4**	**0.3**	**0.4**	**1.9**	**1.7**	**0.3**	**0.6**	**4.3**	**3.2**

[a] All cost figures are presented in 1995 dollars, regardless of the year that they are allocated.
[b] Beyond the year 2008, it is recommended that approximately $50,000 be budgeted annually for continued source reduction.

Phase 1, the City intends to perform additional testing to verify the design assumptions for the separate industrial poplar irrigation system. The City has obtained an agreement to purchase sufficient acreage near the existing WWTF to construct these improvements.

Implementation of this phase will result in the metal toxicity criteria being achieved during most, if not all months. After this phase is operational, the City will collect data and perform additional testing to verify that the criteria are being achieved. This approach assumes that the testing will show that either the metal toxicity criteria are met or that the stream's beneficial uses are not significantly impaired.

Phase 3

Collection system improvements in Phase 3 will include construction of population growth-related interceptors and additional source reduction repairs. Phase 3 liquid treatment facilities will include a fourth aeration basin and a third secondary clarifier. Phase 3 solids treatment facilities will include a sludge dewatering and lime stabilization facility.

The Phase 3 facilities will provide treatment capability for future projected growth to the year 2020. The ongoing sewer rehabilitation will allow the plant to achieve improved percent treatment efficiency during wet weather periods when the plant influent BOD and TSS are significantly diluted by infiltration and inflow. Improvements to the solids treatment facilities will satisfy new sludge regulations (40 CFR 257, Part 503) and provide the option of either landfilling or beneficial reuse (land application) of stabilized sludge. It is anticipated that the addition of filters will allow the metal toxicity criteria to be achieved for year-round discharge. However, if the criteria for toxicity cannot be achieved, the City would evaluate alternatives and implement supplemental improvements to meet the criteria. Alternatives that could be considered include flow augmentation, chemical treatment, and poplar tree irrigation. The capital and O&M costs and the Phase 1 expenditure timeline for this modified implementation approach assuming a poplar tree irrigation system are presented in Tables 10-12, 10-13, and 10-14, respectively.

Table 10-13
Modified Implementation Approach
Estimated Total Annual Sewer O&M Costs

Components	Labor	Power	Chemicals	Maintenance	Miscellaneous	Total
Phase 1						
Administration and Engineering	0.09				0.18	0.27
Maintenance - Collection/Stormwater	0.09	0.01	0	0.08		0.18
Treatment Plant	0.14	0.11	0.10	0.11	0.02	0.48
Total	**0.32**	**0.12**	**0.10**	**0.19**	**0.20**	**0.93**
Phase 2						
Components	**Labor**	**Power**	**Chemicals**	**Maintenance**	**Miscellaneous**	**Total**
Administration and Engineering	0.09				0.18	0.27
Maintenance - Collection/Stormwater	0.09	0.01	0	0.08		0.18
Treatment Plant	0.17	0.11	0.10	0.12	0.02	0.52
Total	**0.35**	**0.12**	**0.10**	**0.20**	**0.20**	**0.97**
Phase 3						
Components	**Labor**	**Power**	**Chemicals**	**Maintenance**	**Miscellaneous**	**Total**
Administration and Engineering	0.09				0.18	0.27
Maintenance - Collection/Stormwater	0.09	0.01	0	0.08		0.18
Treatment Plant	0.26	0.14	0.17	0.19	0.02	0.78
Total	**0.44**	**0.15**	**0.17**	**0.27**	**0.20**	**1.23**

Table 10-12
Modified Implementation Approach
Phased Capital Cost Estimates (1995 $, Millions)

System Component	Phase 1	Phase 2	Phase 3
Collection System			
Ash Creek Interceptor	0.0	0.0	1.2
LaCreole Relief Sewer	0.7	0.0	0.0
Source Reduction	1.0	1.2	1.5
Collection Subtotal	**1.7**	**1.2**	**2.7**
Liquid Treatment			
Operations and Control Building	0.6	0.0	0.0
Influent Pumping	1.6	0.0	0.0
Headworks	0.6	0.0	0.0
Aeration	2.9	0.0	0.9
Secondary Clarification	1.9	0.0	1.0
Filtration	0.0	0.0	1.5
Tertiary Clarification	0.0	0.0	0.0
Disinfection/Dechlorination	1.0	0.0	0.0
Wetlands	0.0	0.0	0.0
Wetlands Land	0.0	0.0	0.0
Reaeration	0.4	0.0	0.0
Intermediate Pumping	0.0	0.0	0.0
Liquid Treatment Subtotal	**9.0**	**0.0**	**3.4**
Liquid Disposal			
WWTP Effluent Storage	0.0	0.0	0.0
WWTP Effluent Pumping	0.0	0.0	0.2
WWTP Pipeline/Distribution	0.0	0.0	3.5
WWTP Irrigation Site Land	0.0	0.6	0.0
Industry Effluent Storage	0.0	1.5	0.0
Industry Effluent Pumping	0.0	0.1	0.0
Industry Pipeline/Distribution	0.0	1.1	0.0
Industry Irrigation Site Land	0.2	0.0	0.0
Outfall	0.2	0.0	0.0
Liquid Disposal Subtotal	**0.4**	**3.3**	**3.7**
Solids Treatment/Disposal			
Humus Pond Improvements	0.3	0.0	0.0
Dewatering and Lime Stabilization	0.0	0.0	1.7
Solids Subtotal	**0.3**	**0.0**	**1.7**
Engineering, Legal, & Admin.	**2.2**	**0.5**	**1.4**
Total Phased Capital Cost	**13.6**	**5.0**	**12.9**

Table 10-14
Modified Implementation Approach
Projected Capital Cost Expenditures by Fiscal Year[a]
(1995 $, Millions)

Improvements	Totals	Fiscal Years 1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Collection System														
Interceptors	1.9				0.4	0.3							0.6	0.6
Source Reduction[b]	3.7	0.1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Treatment System														
Liquids	19.8			4.1	4.1	1.2			1.7	1.6			4.4	2.7
Solids	2.0					0.3							1.1	0.6
Engineering, Legal, and Administration	4.1		0.9	0.5	0.5	0.3		0.1	0.2	0.2		0.7	0.4	0.3
Total Capital Cost	**31.5**	**0.1**	**1.2**	**4.9**	**5.3**	**2.4**	**0.3**	**0.4**	**2.2**	**2.1**	**0.3**	**1.0**	**6.8**	**4.5**

[a] All cost figures are presented in 1995 dollars, regardless of the year that they are allocated.

[b] Beyond the year 2008, it is recommended that approximately $50,000 be budgeted annually for continued source reduction.

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Conclusions and Recommendations

The proposed phased approach to the wastewater system improvements addresses the affordability issue and will meet all of the project goals by allowing the City sufficient time to finance the improvements. The most important immediate goals will be accomplished first and in accordance with the original timetable defined by the Stipulation and Final Order (Appendix B). The second and third phase improvements associated with continued elimination of excessive infiltration and inflow, adding flexibility to comply with beneficial sludge reuse regulations, and providing additional capacity for future growth are planned to be implemented by the year 2008.

This recommended plan is dependent on a conclusion by an environmental assessment that no significant impairment to beneficial uses will occur as the result of potential exceedance of the temperature criteria and TDS guidelines. Based on the preliminary environmental review performed as part of the Facility Plan, no significant impairment of beneficial uses is anticipated. There appears to be greater overall benefit from continued discharge as compared to removal of the water for irrigation. Removal of the effluent from the stream would result in reduced fish and riparian/wetlands habitat, plus it significantly impairs the beneficial use of the stream for irrigation, which would result in socioeconomic impacts to downstream water users. Without the discharge and given the other downstream water users, removal of treated effluent to Rickreall Creek could cause the stream to become impassable for fish. The proposed plan may result in some impairment of the water quality, particularly during dry weather (low stream flow) periods, although the reduced water quality is not anticipated to significantly impair the beneficial uses. For example, the beneficial use for fish passage is not significantly impaired because the fish species of concern are typically not present when stream water quality may be negatively impacted. In addition, downstream water irrigation uses would be maintained.

Water Quality Compliance Plan

Consistent with the phased implementation recommended for facilities improvements, it is proposed that the water quality compliance plan also be implemented in a phased manner. Table 10-15 provides an at-a-glance summary of key elements of the water quality compliance plan. The table is intended to demonstrate how compliance will be achieved with the recommended plan, and to serve as a checklist of regulatory actions that are integral to implementation of the City's preferred plan. Effluent and stream water quality parameters that are critical to achieving compliance are listed. For each parameter, current in-stream water quality is provided upstream and downstream of the existing WWTF outfall, together with expected effluent quality and the resulting in-stream water quality for the three future phases. This predicted future water quality is compared with the Willamette Basin in-stream water quality standards, guidelines, or design criteria as applicable. The comparison forms the basis of the proposed permit effluent limits and associated regulatory actions for specific parameters.

To establish a formal framework and timeline for compliance consistent with the permit effluent limits and regulatory actions proposed in Table 10-15, it is recommended that the City and DEQ enter into a mutual agreement order (MAO). Key elements to be addressed in the MAO include the proposed phased permit effluent limits and the following proposed regulatory actions requested from DEQ and the Environmental Quality Commission (EQC):

- Establish new stream flow-dependent mass loads for $CBOD_5$, TSS, and ammonia-N as proposed in Tables 4-5 and 4-6.
- Approve an exception to the in-stream temperature standard per paragraph (c) of the Proposed Amendments to OAR 340-41-(2)(b).
- Approve a revised definition of the mixing zone for copper toxicity, allowing the zone to span the full width of Rickreall Creek. Also, establish interim allowance for continued discharge at current copper concentrations until Phase 3 implementation.
- Approve an exception to the dilution rule [OAR 340-41-455(1)(f)] based on establishment of the proposed mass loads.

Recommended Financial Plan for Alternative Phasing of the Preferred Implementation Plan

Projected Net Revenues and Rates

Table 10-16 shows projected net revenues and sewer rates generated by the requirements of the alternative phasing program of the Preferred Implementation Plan.

Table 10-17 presents the financial plan for the alternative phasing program for the Preferred Implementation Plan. The phased capital requirements allow the City to manage its cash flow to provide sufficient financing support for the program. Under the assumptions developed in the financial plan, the financing plan for the Preferred Implementation Plan would include:

$ 21.4 million of SRF loans
$ 1.5 million of OEDD grants
$ 1.5 million of OEDD loans

The financing plan is dependent on the outcome of certain assumptions about the customer base, future rates and charges, interest rates, funding policies, growth rates, etc. Actual outcomes will vary from these assumptions and the variance could be material.

Table 10-18 shows an analysis of the affordability of monthly single family dwelling unit rates under the revenue assumptions included in Table 10-15. All rate projections assume that rates will be adjusted over time to ensure that each class of user (residential, commercial, and industrial) contributes revenues in proportion to its use of the system. As shown, the projected rates under the assumptions of the financial plan would be approaching the affordability guidelines provided by the EPA in its publication *Is Your Proposed Water Project Too Costly?* Therefore, the City would consider the financial plan supporting the alternative phasing program affordable from the perspective of single family dwelling unit rates.

Table 10-15
Dallas Wastewater Facility Plan
Water Quality Compliance Plan

Parameter		Existing Requirements and Conditions					Planned Future Conditions									Regulatory Actions Proposed
		Willamette Basin In-Stream Water Quality Standards/Guidelines/Minimum Design Criteria			Existing In-Stream Water Quality[a]		Anticipated Effluent Quality			Anticipated In-Stream Water Quality[a,b]			Proposed Permit Effluent Limits			
		Standards	Guidelines	Design Criteria	Upstream[c]	Downstream[d]	Phase 1	Phase 2	Phase 3	Phase 1	Phase 2	Phase 3	Phase 1	Phase 2	Phase 3	
Dissolved Oxygen and Related Parameters	DO	5.0 mg/L[e]	N/A	>6.5 mg/L	7 to 12 mg/L	7 to 9 mg/L	>6.5 mg/L	>6.5 mg/L	>6.5 mg/L	7 to 11 mg/L	7 to 11 mg/L	7 to 11 mg/L	6.5 mg/L	6.5 mg/L	6.5 mg/L	In-stream water quality achieved. Establish effluent limit as proposed.
	CBOD5	N/A	N/A	S ≤10 mg/L W ≤25 mg/L	N/A	N/A	S ≤10 mg/L W ≤25 mg/L	S ≤10 mg/L W ≤25 mg/L	S ≤5 mg/L W ≤10 mg/L	N/A	N/A	N/A	S ≤10 mg/L W ≤25 mg/L	S ≤10 mg/L W ≤25 mg/L	S ≤5 to 10 mg/L W ≤10 to 25 mg/L	In-stream water quality achieved. Establish stream flow dependent mass limits based on concentrations proposed times the MMADF flows for summer and winter conditions. Suspend peak day mass limit when flows exceed 2 times the DWADF design capacity.
	TSS	N/A	N/A	S ≤10 mg/L W ≤30 mg/L	N/A	N/A	S ≤10 mg/L W ≤30 mg/L	S ≤10 mg/L W ≤30 mg/L	S ≤5 mg/L W ≤10 mg/L	N/A	N/A	N/A	S ≤10 mg/L W ≤30 mg/L	S ≤10 mg/L W ≤30 mg/L	S ≤5 to 10 mg/L W ≤10 to 30 mg/L	In-stream water quality achieved. Establish stream flow dependent mass limits based on concentrations proposed times the MMADF flows for summer and winter conditions. Suspend peak day mass limit when flows exceed 2 times the DWADF design capacity.
	NH3-N	N/A	N/A	N/A	N/A	N/A	S ≤1 mg/L W ≤2 mg/L	S ≤1 mg/L W ≤2 mg/L	S ≤1 mg/L W ≤2 mg/L	N/A	N/A	N/A	1 to 2 mg/L S 2 to 10 mg/L W	1 to 2 mg/L S 2 to 10 mg/L W	S ≤1 to 2 mg/L W ≤2 to 10 mg/L	In-stream water quality achieved. Establish stream flow dependent mass limits based on concentrations proposed times the MMADF flows for summer and winter conditions. Suspend peak day mass limit when flows exceed 2 times the DWADF design capacity.
Temperature		No measurable increase when T≥64°F	N/A	N/A	64 to 70 °F	68 to 73 °F[f]	68 to 74 °F	68 to 74 °F	68 to 74 °F	68 to 73 °F[f]	68 to 73 °F[f]	68 to 73 °F[f]	N/A	N/A	N/A	In-stream temperature impact is less with effluent discharge to Rickreall Creek.Approve an exception to standard per paragraph (c) of the Proposed Amendments to OAR 340-41-(2)(b).
pH		6.5 to 8.5	N/A	N/A	6.8 to 7.6	7.1 to 7.4	6.8 to 7.2	6.8 to 7.2	6.8 to 7.2	7.1 to 7.4	7.1 to 7.4	7.1 to 7.4	6.5 to 8.5	6.5 to 8.5	6.5 to 8.5	In-stream water quality criteria is achieved. Establish effluent limit as proposed.
Bacteria		≤126 E Coli./100 ml[h,i]	N/A	N/A	20 to 220 Fecal Coli./100 ml	20 to 230 Fecal Coli./100ml	<126 E Coli./100ml	<126 E Coli./100ml	<126 E Coli./100ml	20 to 230 Fecal Coli./100ml	20 to 230 Fecal Coli./100ml	20 to 230 Fecal Coli./100ml	<126 E Coli./100ml	<126 E Coli./100ml	<126 E Coli./100ml	Effluent quality is within standard for water quality although in stream water quality may be exceeded because of upstream contamination. Establish effluent limit as proposed.
Total Dissolved Solids		N/A	100 mg/L	N/A	70 to 130 mg/L	130 to 250 mg/L	230 to 360 mg/L	230 to 360 mg/L	200 to 330 mg/L	200 to 300 mg/L	200 to 300 mg/L	150 to 250 mg/L	N/A	N/A	N/A	In-stream water quality guideline is exceeded; however, no significant impairment of beneficial uses is anticipated. No regulatory action required.
Chlorophyll-a		N/A	15 ug/L	N/A	1 to 3 ug/L	1 to 6 ug/L	N/A	N/A	N/A	2 to 20 ug/L	2 to 20 ug/L	2 to 20 ug/L	N/A	N/A	N/A	In-stream water quality guideline is achieved within margin of error for chlorophyll-a modeling. No regulatory action required.
Toxicity - Copper		18 ug/L Acute 12 ug/L Chronic	N/A	N/A	4 to 8 ug/L	200 to 300 ug/L[f]	200 to 300 ug/L	20 to 50 ug/L	12 to 18 ug/L	200 to 300 ug/L[f]	20 to 50 ug/L[f]	12 to 18 ug/L[f]	N/A	N/A	N/A	In-stream water quality criteria achieved in Phase 3 assuming full width mixing zone. Establish interim allowance for continued discharge of metals at or below current discharge levels and request authorization for fill width mixing zone.
Minimum Treatment Efficiency		85%[g]	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	85% @Q<2 mgd, 65% @ Q>2 mgd	85% @Q<2 mgd, 65% @ Q>2 mgd	85% @Q<3.07 mgd, 75% @ 3.07>Q<4.64 mgd, 65% @ Q>4.64 mgd	Minimum percent removal criteria achieved when flows are < the DWMMADF (3.07 mgd). Approve exception to 85% treatment efficiency standard.

[a] Based on summer water quality data.
[b] Based on modeling at 7Q10 stream flows.
[c] As measured 100 feet upstream of the existing outfall.
[d] As measured at Highway 51 (Independence Highway) unless otherwise noted.
[e] Seven day minimum mean.
[f] As measured at the edge of the mixing zone.
[g] Minimum treatment efficiency as defined by USEPA 40 CFR Part 133.
[h] Based on 30 day log mean and no single sample >406 E Coli./100 mL.
[i] Previous standard was 200 Fecal Coli./100 mL.

Table 10-16
Projected Revenues and Expenditures through FY ending 2008
Preferred Implementation Plan

	Actual	Estimated	Projected											
Fiscal Year Ending	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**
Revenues														
Charges for service[a]	$1,162,851	$1,371,656	$1,651,086	$1,872,851	$2,103,719	$2,343,531	$2,511,660	$2,651,857	$2,829,359	$2,978,040	$3,165,654	$3,322,493	$3,519,736	$3,591,203
Other revenues[b]	34,214	59,106	80,313	70,525	28,534	34,458	36,811	50,444	63,630	40,425	42,768	65,007	74,888	51,848
Total revenues	1,197,065	1,430,762	1,731,399	1,943,376	2,132,253	2,377,989	2,548,471	2,702,301	2,892,989	3,018,465	3,208,421	3,387,500	3,594,624	3,643,051
Expenditures														
Operating expenses[c]	559,134	724,546	753,528	783,669	815,016	1,120,608	1,176,747	1,223,817	1,272,769	1,326,691	1,435,837	1,493,270	1,553,001	1,758,894
Net revenues	$637,931	$706,216	$977,871	$1,159,707	$1,317,237	$1,257,381	$1,371,724	$1,478,485	$1,620,219	$1,691,774	$1,772,585	$1,894,229	$2,041,623	$1,884,157
Rate increase during year	29.44%	22.75%	11.10%	10.00%	9.10%	8.33%	0.00%	7.67%	0.00%	7.15%	0.00%	6.67%	0.00%	0.00%
Residential Rate at end of FY	$22.00	$27.00	$30.00	$33.00	$36.00	$39.00	$39.00	$42.00	$42.00	$45.00	$45.00	$48.00	$48.00	$48.00

[a]Charges for services assumes an increase of 100 residential units annually.
[b]Other revenues include miscellaneous income and investment earnings. Investment earnings assume a 4% earnings on reserves and 90% of ending fund balances.
[c]Operating expenses as projected by Ch2M HILL.

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Table 10-17
Financial Plan for Alternative Phasing Program
Preferred Implementation Plan

	Actual	Estimated	Projected											
Fiscal Year Ending	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Beginning Balance	$743,917	$1,294,609	$1,768,334	$1,482,001	$203,101	$237,601	$237,701	$599,501	$948,201	$264,901	$251,301	$849,301	$1,103,201	$304,501
Sources of Funds														
Net revenues	637,931	706,124	977,900	1,159,700	1,317,200	1,257,400	1,371,700	1,478,500	1,620,200	1,691,800	1,772,600	1,894,200	2,041,600	1,884,200
Transfer from SDC Fund (a)		120,000	125,000	150,000	175,000	200,000	225,000	250,000	260,000	270,400	281,200	292,500	304,200	316,300
Borrowing proceeds (b)														
SRF Loans				2,400,000	5,600,000	2,400,000			1,000,000	550,000			4,350,000	5,100,000
OEDD Grants				500,000						500,000			500,000	
OEDD Loans				500,000						500,000			500,000	
Total Sources of Funds	**637,931**	**826,124**	**1,102,900**	**4,709,700**	**7,092,200**	**3,857,400**	**1,596,700**	**1,728,500**	**2,880,200**	**3,512,200**	**2,053,800**	**2,186,700**	**7,695,800**	**7,300,500**
Uses of Funds														
Capital costs (c)	11,239	117,500	1,297,900	5,511,800	6,200,300	2,920,000	379,600	526,400	2,600,300	2,419,600	444,100	923,700	6,884,400	5,328,200
Other transfers		52,232												
Debt service reserve deposit (d)		91,333		87,700	103,000	44,100			18,400	53,700			123,600	93,800
SRF loan fee (e)				36,000	84,000	36,000			15,000	8,300			65,300	76,500
Cost of issuance				30,000						30,000			30,000	
Debt service														
SRF loans (f)	76,000	91,333	91,333	267,900	588,600	765,200	765,200	765,200	838,800	879,300	879,300	879,300	1,199,400	1,574,700
OEDD loans (g)				43,600	43,600	43,600	43,600	43,600	43,600	87,200	87,200	87,200	130,800	130,800
SRF service charge (h)				11,600	38,200	48,400	46,500	44,600	47,400	47,700	45,200	42,600	61,000	82,100
Total Uses of Funds	87,239	352,398	1,389,233	5,988,600	7,057,700	3,857,300	1,234,900	1,379,800	3,563,500	3,525,800	1,455,800	1,932,800	8,494,500	7,286,100
Ending Balance	1,294,609	1,768,334	1,482,001	203,101	237,601	237,701	599,501	948,201	264,901	251,301	849,301	1,103,201	304,501	318,901
Debt Service Coverage (Includes SDCs)	8.39	9.05	12.08	4.20	2.36	1.80	1.97	2.14	2.13	2.03	2.12	2.26	1.76	1.29

[a] Transfer of 50% of SDC revenues. Assumes 100 new connections per year.

[b] Ability to obtain loans/grants is subject to approval and changes in policies and funding availability.

[c] Capital costs are in current year dollars.

[d] Debt service reserve of 25% of annual debt service for SRF loans and 100% of annual debt service for OEDD loans.

[e] SRF Loan fee is equal to 1.5% of loan amount.

[f] SRF Loan debt service based on 4% interest rate.

[g] OEDD Loan debt service based on 6% interest rate.

[h] SRF has an annual service charge equal to 0.5% of the outstanding loan balance.

Table 10-18 Affordability Analysis of Projected Rates				
	Median Household Income[a]	Maximum Affordable Monthly Rates[b]	Monthly Rates	Rate Increase (%)
1993	$26,304	$32.88	$13.00	
1994	$27,356	$34.20	$17.00	31%
1995	$28,450	$35.56	$22.00	29%
1996	$29,588	$36.98	$27.00	23%
1997	$30,771	$38.46	$30.00	11%
1998	$32,002	$40.00	$33.00	10%
1999	$33,282	$41.60	$36.00	9%
2000	$34,614	$43.27	$39.00	8%

[a]1990 median household income based on 1990 census for City of Dallas, adjusted to 1995 using Consumer Price Index and inflated at 4 percent per year.

[b]Based on Draft EPA Affordability Guidelines (EPA, 19984) of 1.5 percent of median household income.

Recommended Financial Plan for Alternative Phasing of the Modified Implementation Plan

Projected Net Revenues

Table 10-19 shows projected net revenues and sewer rates generated by the requirements of the alternative phasing program of the Modified Implementation Plan.

Table 10-20 presents the financial plan for the alternative phasing program for the Modified Implementation Plan.

Under the assumptions developed in the financial plan, total program financing requirement would include:

- $ 23.25 million of SRF loans
- $ 1.5 million of OEDD grants
- $ 1.5 million of OEDD loans

In addition, $5.9 million from other sources of funding will be required. The additional source of funding could include a combination of grants, revenue bonds, and general obligation bonds. Grants may be sought from RECD and OEDD. Additional loans or revenue bonds may be issued; however, sewer rates will need to be increased to meet the debt service coverage requirements for the debt. In addition, although the City prefers not to program the use of general obligation bonds to support this project because of uncertainty of voter approval, in order to maintain rates at affordable levels, it will be necessary to attain some financial support through general obligation bonds.

Table 10-19
Projected Revenues and Expenditures through FY ending 2008
Modified Implementation Plan

	Actual	Estimated	Projected											
Fiscal Year Ending	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Revenues														
Charges for Service (a)	$1,162,851	$1,371,656	$1,651,086	$1,872,851	$2,103,719	$2,343,531	$2,591,928	$2,766,832	$2,913,650	$3,098,656	$3,253,633	$3,448,270	$3,580,745	$3,740,597
Other revenues (b)	34,214	59,106	80,313	70,525	30,169	34,376	36,725	53,245	70,672	40,080	42,776	66,506	57,123	53,431
Total revenues	1,197,065	1,430,762	1,731,399	1,943,376	2,133,887	2,377,906	2,628,653	2,820,077	2,984,322	3,138,736	3,296,409	3,514,776	3,637,868	3,794,028
Expenditures														
Operating expenses (c)	559,134	724,546	753,528	783,669	815,016	1,120,608	1,176,747	1,223,817	1,272,769	1,326,691	1,435,837	1,493,270	1,553,001	1,800,521
Net revenues	$637,931	$706,216	$977,871	$1,159,707	$1,318,872	$1,257,299	$1,451,906	$1,596,260	$1,711,553	$1,812,045	$1,860,572	$2,021,505	$2,084,867	$1,993,507
Rate Increase during year	29.44%	22.75%	11.10%	10.00%	9.10%	8.33%	7.67%	0.00%	7.15%	0.00%	6.67%	0.00%	4.16%	0.00%
Residential Rate at end of FY	$22.00	$27.00	$30.00	$33.00	$36.00	$39.00	$42.00	$42.00	$45.00	$45.00	$48.00	$48.00	$50.00	$50.00

[a]Charges for services assumes an increase of 100 residential units annually.
[b]Other revenues include miscellaneous income and investment earnings. Investment earnings assume a 4% earnings on reserves and 90% of ending fund balances.
[c]Operating expenses as projected by Ch2M HILL.

Table 10-20
Financial Plan for Alternative Phasing Program
Modified Implementation Plan

Fiscal Year Ending	Actual 1995	Estimated 1996	Projected 1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Beginning Balance	$743,917	$1,294,609	$1,768,334	$1,482,001	$247,401	$235,201	$235,201	$677,201	$1,143,701	$225,201	$239,201	$878,601	$597,401	$233,901
Sources of Funds														
Net revenues	637,931	706,124	977,900	1,159,700	1,318,900	1,257,300	1,451,900	1,596,300	1,711,600	1,812,000	1,860,600	2,021,500	2,084,900	1,993,500
Transfer from SDC Fund (a)		120,000	125,000	150,000	175,000	200,000	225,000	250,000	260,000	270,400	281,200	292,500	304,200	316,300
Borrowing proceeds (b)														
SRF Loans				2,450,000	5,550,000	2,400,000			100,000	2,050,000			9,350,000	1,350,000
OEDD Grants				500,000					500,000				500,000	
OEDD Loans				500,000					500,000				500,000	
Total Sources of Funds	**637,931**	**826,124**	**1,102,900**	**4,759,700**	**7,043,900**	**3,857,300**	**1,676,900**	**1,846,300**	**3,071,600**	**4,132,400**	**2,141,800**	**2,314,000**	**12,739,100**	**9,559,800**
Uses of Funds														
Capital costs (c)	11,239	117,500	1,297,900	5,511,800	6,200,300	2,920,000	379,600	526,400	3,010,900	2,989,000	444,100	1,539,500	10,887,000	7,492,800
Other transfers		52,232												
Debt service reserve deposit (d)		91,333		88,700	102,100	44,100			45,400	37,700			215,600	24,800
SRF loan fee (e)				36,800	83,300	36,000			1,500	30,800			140,300	20,300
Cost of issuance				30,000					30,000				30,000	84,000
Debt service														
SRF loans (f)	76,000	91,333	91,333	271,600	588,600	765,200	765,200	765,200	772,600	923,400	923,400	923,400	1,611,400	1,710,700
OEDD loans (g)				43,600	43,600	43,600	43,600	43,600	87,200	87,200	87,200	87,200	130,800	130,800
SRF service charge (h)				11,800	38,200	48,400	46,500	44,600	42,500	50,300	47,700	45,100	87,500	89,500
Total Uses of Funds	87,239	352,398	1,389,233	5,994,300	7,056,100	3,857,300	1,234,900	1,379,800	3,990,100	4,118,400	1,502,400	2,595,200	13,102,600	9,552,900
Ending Balance	1,294,609	1,768,334	1,482,001	247,401	235,201	235,201	677,201	1,143,701	225,201	239,201	878,601	597,401	233,901	240,801
Debt Service Coverage (Includes SDCs)	8.39	9.05	12.08	4.16	2.36	1.80	2.07	2.28	2.29	2.06	2.12	2.29	1.37	1.25

[a] Transfer of 50% of SDC revenues. Assumes 100 new connections per year.

[b] Ability to obtain loans/grants is subject to approval and changes in policies and funding availability.

[c] Capital costs are in current year dollars.

[d] Debt service reserve of 25% of annual debt service for SRF loans and 100% of annual debt service for OEDD loans.

[e] SRF Loan fee is equal to 1.5% of loan amount.

[f] SRF Loan debt service based on 4% interest rate.

[g] OEDD Loan debt service based on 6% interest rate.

[h] SRF has an annual service charge equal to 0.5% of the outstanding loan balance.

Again, the financing plan is dependent on the outcome of certain assumptions about the customer base, future rates and charges, interest rates, funding policies, growth rates, etc. Actual outcomes will vary from these assumptions and the variance could be material.

Conclusion

The analysis in this chapter shows that an immediate implementation of the wastewater facility plan is not affordable. Therefore, a phased implementation approach is necessary.

In addition, the analysis shows that under the planned rate increases described in this chapter, a phased implementation of the Preferred Implementation Plan is possible. However, the analysis shows that additional sources of funding will be required to implement the Modified Implementation Plan.

Chapter 11
Public Participation

CHAPTER 11

PUBLIC PARTICIPATION

This chapter contains a summary of the public participation activities and programs that have been conducted throughout the wastewater facility planning process.

Prior Activities and Programs

Early opportunity for the public to participate in Dallas' wastewater facility planning process occurred in 1987 through the public involvement process associated with the adoption of the City's Comprehensive Plan. The plan recognized the need to address many of Dallas' wastewater facility issues and established policies and proposals that guided the City in developing both a priority list for system improvements and a schedule for additions to the treatment plant. Prompted by DEQ's compliance order, in 1992 the City Council adopted the wastewater facility improvements as one of its highest priority goals.

Citizens Advisory Committee

In response to the Council's adoption of the water quality and facility improvement goals, the Utilities Citizens Advisory Committee (CAC) was asked by the Mayor and the Council to also serve as advisors for the wastewater facility planning effort. The members of the CAC reviewed procedures and documents, and provided recommendations for the program.

Public Meetings and Presentations

Following the City's authorization of CH2M HILL to initiate work on the wastewater issues, the CAC met monthly to review project progress, address issues, and provide recommendations concerning the project. The meetings were open to the public and minutes are maintained by the City. Recommendations made during these meetings were instrumental during the development of the Wastewater Facility Plan.

Facility Planning Public Participation Activities

As part of the facility planning effort, a public participation program was implemented to better inform the public and encourage greater participation in the facility planning process. The details of the facility planning public participation program are outlined below.

Public Education/Involvement Plan

A Public Education/Involvement Plan was developed to provide project technical participants, decisionmakers, and the public, the following:

- Project background information regarding problems, issues, goals, and past achievements

- Definition of affected citizens
- List of interested persons
- Mechanisms for relaying information and public involvement
- Participant responsibilities

The Public Education/Involvement Plan (see Appendix F) was developed using guidelines contained in EPA's publication, *Municipal Wastewater Management: Citizens' Guide to Facility Planning* (EPA, 1979). Mechanisms to inform the public and encourage public comments included newsletters, CAC meetings, public meetings, and a public hearing.

Newsletters

Four newsletters were published and mailed to all sewer customers. Copies were also provided to citizens not on the mailing list but who requested them, and were made available at City Hall. Each newsletter contained an update on project activities, results of ongoing investigations and analyses, and schedules for upcoming meetings. Copies of the first three newsletters are included in Appendix F. The fourth newsletter was published just prior to submittal of this document.

Public Meetings

Prior to the completion of the August 1994 Wastewater Facility Plan, the City held public meetings on March 15 and June 29, 1993. Published notifications appeared in project newsletters and the Dallas *Itemizer-Observer* prior to each meeting.

The meetings were chaired by Roger Jordan, City Manager, who was assisted by other city staff and CH2M HILL representatives. The meetings were conducted informally as information exchange workshops. Meetings started with project updates and included presentations on recent findings. Presentations were followed by a question and answer period. The following is a summary of the concerns and questions raised during the meetings:

- Identification of wastewater collection, disposal, and water quality problem areas
- The classification of Rickreall Creek as a salmonid-rearing stream
- The potential for future regulations for both Rickreall Creek and the Willamette River to change
- The need for more comprehensive water basin management and specifically more winter water storage on Rickreall Creek to allow supplement of summer creek flows
- Technical and public health issues regarding the possible treatment plant options, effluent irrigation, and sludge disposal options

Meeting minutes from the first public meeting are included in Appendix F.

A third public meeting is scheduled for March 11, 1996, to review the Revised Facility Plan.

Public Hearing

A formal public hearing on the August 1994 Wastewater Facility Plan was held by the City on November 15, 1993. About 4 weeks prior to the public hearing, copies of the draft Facility Plan were made available for public review at these locations:

- Dallas Public Works Department
- Dallas Public Library

A notification of public availability of the plan for public review and solicitation of public comments was published in the Dallas *Itemizer-Observer*.

A public hearing for the Revised Facility Plan is scheduled for April 1, 1996.

Public Notification

Notice of the public hearing was published in the Dallas *Itemizer-Observer* 2 weeks and 1 week before the hearing. Notices were posted at the Dallas City Hall and the Public Library.

Hearing Summary

Comments from local agencies and citizens were solicited at the hearing. In addition to hearing testimony, written comments from individuals and agencies were solicited. A summary of the hearing, including testimony, is included in Appendix F. Written testimony was received by the City from one Dallas resident. The resident supported the preferred plan, but was frustrated by the expense associated with piping treated effluent to the Willamette River.

Appendix A
Current NPDES Permit

Orego

DEPARTMENT (
ENVIRONMENT.
QUALITY

JUN 3 0 1993

CERTIFIED MAIL
RETURN RECEIPT REQUESTED

City of Dallas
P.O. Box 67
Dallas, OR 97338

Re: Waste Discharge Permit
File No. 22546
Polk County

We have completed our review of your permit application and comments received on the preliminary draft permits which were mailed to you for review May 18, 1992 and May 18, 1993. The enclosed NPDES permit has been issued. You will also find enclosed, the original Permit Evaluation Report (revised September 4, 1992) and the Permit Evaluation Report Addendum (revised June 24, 1993).

This permit will be considered as the final action on permit application number 998751.

If you are dissatisfied with the conditions or limitations of this permit, you have 20 days to request a hearing before the Environmental Quality Commission or its authorized representative. Any such request shall be made in writing to the Director and shall clearly state the grounds for the request.

You are urged to carefully read the permit and take all possible steps to comply with the conditions established. If you have questions regarding the permit, please contact Dick Nichols at 229-5323 Portland or Sharon Hays at 229-6796.

Sincerely,

Michael Downs
Administrator
Water Quality Division

dh
Enclosure
cc: U.S. Environmental Protection Agency
Willamette Valley Region, DEQ
Municipal Projects, DEQ, Sharon Hays
Municipal Projects, DEQ, Richard Santner

811 SW Sixth Avenue
Portland, OR 97204-13
(503) 229-5696
TDD (503) 229-6993

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM
WASTE DISCHARGE PERMIT

Department of Environmental Quality
811 S.W. Sixth Avenue, Portland, OR 97204
Telephone: (503) 229-5696

Issued pursuant to ORS 468B.050 and The Federal Clean Water Act

ISSUED TO:

City of Dallas
P.O. Box 67
Dallas, OR 97338

SOURCES COVERED BY THIS PERMIT:

Type of Waste	Outfall Number	Outfall Location
Treated Municipal Wastewater	001	Rickreall Creek RM 8.5

PLANT TYPE AND LOCATION:
Activated Sludge Municipal
Wastewater Treatment Plant
Bowersville Road, Dallas

Treatment System Class: III
Collection System Class: III

RECEIVING SYSTEM INFORMATION:
Basin: Willamette
Sub-Basin: Middle Willamette
Stream: Rickreall Creek
Hydro Code: 22H-RICK 8.5 D
County: Polk

EPA REFERENCE NO: OR 002073-7

Issued in response to Application No. 998751 received 03-06-89.

This permit is issued based on the land use findings in the permit record.

Michael Downs (signature)
Michael Downs, Administrator

JUN 30 1993
Date

PERMITTED ACTIVITIES

Until this permit expires or is modified or revoked, the permittee is authorized to construct, install, modify, or operate a wastewater collection, treatment, control and disposal system and discharge to public waters adequately treated wastewaters only from the authorized discharge point or points established in Schedule A and only in conformance with all the requirements, limitations, and conditions set forth in the attached schedules as follows:

Unless authorized by another NPDES permit, all direct and indirect discharges to public waters not authorized by this permit are prohibited.

SCHEDULE A

1. **Waste Discharge Limitations not to be Exceeded After Permit Issuance.**

Note: The effluent discharge limitations are derived from Waste Load Allocations (WLAs) based upon the assumption that all of Rickreall Creek is salmonid-producing such that the dissolved oxygen standard of 90% and 95% of saturation, summer and winter, respectively, would apply from the point of discharge to the confluence with the Willamette River. The WLAs are also based upon a design flow for the permittee's existing sewage treatment plant of 2.0 MGD. These WLAs may be revised if the permittee proposes to relocate the outfall to another point along the stream; if new information is developed that indicates that either all or a portion of Rickreall Creek is not salmonid-producing; if design flows change; and/or if discharge is restricted to creek flow conditions greater than those used to calculate these WLAs. Future waste discharge limitations prescribed in a new or modified permit will be based upon WLAs appropriate for the location of the outfall and the requirements of the specific receiving stream or proposed treatment plant capabilities, whichever are more stringent. (Treatment plant capabilities shall be based upon operational and physical capabilities of the treatment plant as defined through negotiations between permittee and the Department.)

Outfall Number 001 (Sewage Treatment Plant Discharge)

(1) May 1 - October 31:

(a) **When monthly average daily flow in Rickreall Creek is less than 90 CFS: No discharge of wastewater is permitted.**

(b) When monthly average daily flow in Rickreall Creek is 90 CFS or greater, the following effluent discharge limitations shall apply:

	Average Effluent Concentrations		Monthly* Average	Weekly* Maximum	Daily* lbs
Parameter	Monthly	Weekly	lb/day	lb/day	
CBOD5 **	10 mg/l	15 mg/l	170	250	330
TSS **	10 mg/l	15 mg/l	170	250	330
FC/ 100 ml	200	400			

* Mass load limitations are based on an effluent flow of 2.0 MGD and those concentrations as necessary to avoid water quality standards violations in Rickreall Creek.

** For the purpose of determining compliance with the limitations for $CBOD_5$, TSS and NH_3-N, averages shall be calculated only from data collected on days when discharge occurs. The permittee shall not consider days when no discharge occurs as a zero for the purpose of calculating averages.

(2) November 1 - April 30:

(a) When monthly average daily flow in Rickreall Creek is 45 CFS or less: No discharge of wastewater is permitted.

(b) When monthly average daily flow in Rickreall Creek is greater than 45 CFS but does not exceed 120 cfs, the following effluent discharge limitations shall apply:

Parameter	Average Effluent Concentrations Monthly	Weekly	Monthly* Average lb/day	Weekly* Maximum lb/day	Daily* lbs
$CBOD_5$ **	5 mg/l	7.5 mg/l	83	130	170
TSS **	5 mg/l	7.5 mg/l	83	130	170
NH_3-N **	0.5 mg/l	0.75 mg/l	8.3	13	17
FC/ 100 ml	200	400			

Dissolved Oxygen — Shall not be less than a daily average concentration of 8.2 mg/l.

(c) When monthly average daily flow in Rickreall Creek is greater than 120 CFS, the following effluent discharge limitations shall apply:

Parameter	Average Effluent Concentrations Monthly	Weekly	Monthly* Average lb/day	Weekly* Maximum lb/day	Daily* lbs
$CBOD_5$**	20 mg/l	25 mg/l	330	500	670
TSS **	20 mg/l	25 mg/l	330	500	670
FC/ 100 ml	200	400			

* Mass load limitations are based on an effluent flow of 2.0 MGD and those concentrations as necessary to avoid water quality standards violations in Rickreall Creek.

** For the purpose of determining compliance with the limitations for $CBOD_5$, TSS and NH_3-N, averages shall be calculated only from data collected on days when discharge occurs. The permittee shall not consider days when no discharge occurs as a zero for the purpose of calculating averages.

(3) Other Parameters (Year-round)

Item or Parameter	Limitations
(a) pH	Shall be within the range 6.0 - 9.0.
(b) BOD and TSS Removal Efficiency	Shall not be less than 85% monthly average.
(c) Total Chlorine Residual	Shall not exceed a monthly average concentration of 0.012 mg/l and a daily maximum concentration of 0.03 mg/l.

(3) Other Parameters, continued

Item or Parameter	Limitation
(d) Temperature	(i) When the temperature of Rickreall Creek at the point of discharge is 58° F. or greater, the effluent temperature shall not cause the temperature of the Creek outside the mixing zone to exceed the Creek temperature as measured above the point of discharge. (ii) When the temperature of Rickreall Creek at the point of discharge is less than 58° F., effluent temperature shall be limited so as not to increase the temperature of the Creek more than 0.5° F. outside the mixing zone specified in the permit.

(4) Notwithstanding the effluent limitations established by this permit, no wastes shall be discharged and no activities shall be conducted which violate Water Quality Standards as adopted in OAR 340-41-445, except in the defined mixing zone:

The allowable mixing zone shall not exceed that portion of Rickreall Creek within a radius of 100 feet at the point of discharge.

SCHEDULE B

1. Minimum Monitoring and Reporting Requirements.
(unless otherwise approved in writing by the Department)

The permittee shall monitor the parameters as specified below at the locations indicated. The laboratory used by the Permittee to analyze samples shall have a quality assurance/quality control (QA/QC) program to verify the accuracy of sample analysis. If QA/QC requirements are not met for any analysis, the results shall be included in the report, but not used in calculations required by this Permit. When possible, the Permittee shall re-sample in a timely manner for parameters failing the QA/QC requirements, analyze the samples, and report the results.

a. Influent

Item or Parameter	Minimum Frequency	Type of Sample
Total Flow (MGD)	Daily	Measurement
Flow Meter Calibration	Annually	Verification
$CBOD_5$	2/Week	Composite
TSS	2/Week	Composite
pH	3/Week	Grab

b. Outfall Number 001 (Sewage Treatment Plant Outfall)

Item or Parameter	Minimum Frequency	Type of Sample
Total Flow (MGD)	Daily	Measurement
Flow Meter Calibration	Annually	Verification
$CBOD_5$	2/Week	Composite
TSS	2/Week	Composite
pH	3/Week	Grab
Fecal Coliform	2/Week	Grab
Chlorine Residual	Daily	Calculation
Temperature	1/Week	Grab
Dissolved Oxygen	Daily	Grab
Average Percent Removal (BOD and TSS)	Monthly	Calculation
Nutrients:		
TKN, NO_2+NO_3-N Total Phosphate (mg/l)	1/Week (May-Oct)	24-Hr Daily Composite (See Note 1/)
NH_3-N (mg/l)	1/Week (May-Oct)	Composite

b. Outfall Number 001, continued

TOXICS:

Item or Parameter	Minimum Frequency	Type of Sample
Metals: Cd, Cu, Ni, Pb, Zn (measured in total mg/l)	Annually (August)	24-Hr Daily Composite (See Note 1/)
++ Bioassay of effluent from Outfall 001 (See Note 2/)	Quarterly	Acute and chronic bioassay

++ Until the existing sewerage facilities are upgraded pursuant to Stipulation and Final Order (WQ-WVR-92-058), bioassays will be conducted on de-chlorinated samples. After upgrade, bioassays will be conducted, if necessary, on whole effluent samples.

c. Rickreall Creek (See Note 3/)

Item or Parameter	Minimum Frequency	Type of Sample
Flow - upstream	1/Week	Grab
Temperature - upstream	1/Week	Grab
Temperature - downstream	1/Week	Calculation

d. Sludge Management

Item or Parameter	Minimum Frequency	Type of Sample
Sludge analysis including: Total solids (% dry wt.) Volatile solids (% dry wt.) Volatile Suspended Solids (% Dry Wt.) Sludge nitrogen NH_3-N; NO_3-N; & TKN (% dry wt.) Phosphorus (% dry wt.) Potassium (% dry wt.) pH (standard units)	Annually	Composite samples representative of the product to be land applied from humus ponds beds (See Note 4/)
Sludge Metals: As, Cd, Cr, Cu, Pb, Hg, Mo, Ni, Se & Zn (mg/kg)	Annually	

d. Sludge Management, continued

Item or Parameter	Minimum Frequency	Type of Sample
Record of % volatile solids reduction accomplished through digestion	Monthly	Calculation (See Note 5/)
Record of locations where sludge is applied on land (Site location map to be maintained at treatment facility for review upon request by DEQ)	Each Occurrence	Date, volume & locations where sludges were applied recorded on site location map.
Quantity and type of lime product used to stabilize sludge (when required to meet federal Process to Significantly Reduce Pathogens (PSRP) regulations	Each Occurrence	Pounds/gallon of sludge land applied

Notes:

1/ Daily 24-hour composite samples shall be analyzed and reported separately.

2/ During the first year following permit issuance, the Permittee shall conduct bioassay testing in accordance with the frequency specified above. The bioassay testing shall be conducted in August 1993, November 1993, February 1994, and May 1994. If bioassay tests show that the effluent samples are not toxic at the dilutions determined to occur at the Zone of Immediate Dilution and the Mixing Zone, no further bioassay testing will be required during this Permit cycle. Note that bioassay test results will be required along with the next NPDES Permit renewal application.

3/ Rickreall Creek flow and temperature shall be obtained upstream from the outfall location. The theoretical temperature of the Creek downstream from the outfall location shall be calculated weekly, based on the following mass balance equation:

$$T' = [(T_e * Q_e) + (T_R * (0.646 * Q_R))] / [Q_e + (0.646 * Q_R)]$$

Where:

T' = downstream temperature of Rickreall Creek, °F
T_e = effluent temperature, °F
Q_e = effluent flow, MGD
T_R = Rickreall Creek temperature upstream, above outfall location, °F
Q_R = Rickreall Creek flow upstream, above outfall location, CFS

For the purposes of calculating Rickreall Creek temperature downstream from the outfall location, T_e, Q_e, T_R and Q_R shall be instantaneous values measured within a thirty (30) minute period.

4/ Composite samples from the humus ponds shall consist of blending equal fractions of grab samples taken from the center of each load of dried sludge removed from the humus ponds. The sampling shall be representative of the pond contents.

5/ Calculation of the % volatile solids reduction is to be based on comparison of a representative grab sample of total and volatile solids entering each digester (a weighted blend of the secondary clarifier solids) and a representative composite sample of sludge solids exiting in each humus ponds (as defined in note 4/ above).

2. Reporting Procedures

a. Monitoring results shall be reported on approved forms. The reporting period is the calendar month. Reports must be submitted to the Department by the 15th day of the following month.

b. State monitoring reports shall identify the name, certificate classification and grade level of each principal operator designated by the Permittee as responsible for supervising the wastewater collection and treatment systems during the reporting period. Monitoring reports shall also identify each system classification as found on page one of this Permit.

c. Monitoring reports (DMRs) shall include a record of the location, quantity and method of use of all sludge removed from the treatment facility and a record of all applicable equipment breakdowns and bypassing.

SCHEDULE C

Compliance Schedules and Conditions

1. Industrial Waste Survey/Pretreatment Program

   a. By no later than September 30, 1993, the permittee shall submit the results of an industrial waste survey as required by 40 CFR 403.8(f)(2)(i-iii) in order to make a determination as to the need and type of Pretreatment Program to be developed. The survey shall be conducted in accordance with Chapter Two of EPA's 1983 Guidance Manual for POTW Pretreatment Program Development, and shall include, but not be limited to:

      (1) Identification of industrial users and the character and volume of pollutants contributed to the POTW by the industrial users; and,

      (2) Identification of all industrial users that meet the Federal definition of Significant Industrial User (SIU).

   b. By no later than December 31, 1993, the Permittee shall submit for Departmental approval a draft of the pretreatment provisions of the City's Sewer Use Ordinance to incorporate all legal authorities required to implement the pretreatment program in accordance with the most recent version of 40 CFR, Part 403, including those requirements outlined in 40 CFR 403.8(f)(1).

   c. By no later than December 31, 1993, the Permittee shall submit the results of the sewage treatment plant influent, effluent and biosolids (sludge) monitoring necessary to develop technically based Local Limits. Monitoring shall consist of two sampling events (one during dry weather and one during wet weather) and include, at a minimum, sampling for Arsenic, Cadmium, Chromium, Copper, Cyanide, Lead, Mercury, Nickel, Silver, Zinc, Oil and Grease, Toluene and Phenolic compounds and any other toxic pollutants that might be expected in the treatment plant influent, effluent or biosolids.

   d. By no later than December 31, 1993, the Permittee shall submit written procedures describing how the City's Pretreatment Program will accomplish the activities described in 40 CFR 403.8(f)(1),(2),(3) and (5).

   e. By no later than March 31, 1994, the Permittee shall submit for Departmental approval a technical Local Limits evaluation performed in accordance with established DEQ and EPA guidance. This evaluation shall include, but not be limited to:

      (1) Local Limits for Arsenic, Cadmium, Chromium, Copper, Cyanide, Lead, Mercury, Nickel, Silver, Zinc, Oil and Grease, Toluene and Phenolic compounds.

f. By no later than July 31, 1994, the Permittee shall submit for Departmental approval all final program documents. The final Pretreatment Program shall include, but not be limited to:

(1) Completed versions of the City's legal authority to implement the Program;

(2) An Implementation Manual which describes the procedures to carry out specific Program responsibilities; and,

(3) Local Limits development documentation.

2. Grit Removal Requirement

By no later than September 30, 1994, the Permittee shall submit to the Department for review and approval a report that describes procedures for handling, transporting and disposal of rags, grit, scum and screenings generated at the treatment facility. Upon written approval by the Department, the Permittee shall conform with the approved procedures. Modified procedures may be followed upon prior approval in writing by the Department.

3. Infiltration and Inflow Reduction Program

The Permittee shall have in place an on-going program to identify and reduce inflow and infiltration into the sewage collection system. An annual report shall be submitted to the Department by January 15 of each year which details sewer collection maintenance activities that have been done in the previous year and outlines those activities planned for the upcoming year.

4. The Permittee is expected to meet the compliance dates which have been established in this schedule. Either prior to or no later than 14 days following any lapsed compliance date, the Permittee shall submit to the Department a notice of compliance or noncompliance with the established schedule. The Director may revise a schedule of compliance if he determines good and valid cause resulting from events over which the Permittee has little or no control.

SCHEDULE D

Special Conditions

1. Bioassay (See Note A/)

   a. The Permittee shall conduct chronic whole effluent toxicity bioassay tests of outfall 001 in accordance with the frequency specified in Schedule B with Ceriodaphnia dubia (water flea), Pimephales promelas (fathead minnow) and Selanastrum capricornutum (green algae).

   b. Bioassay tests shall be dual end-point tests in which both acute and chronic end-points (No Observable Adverse Effect Concentration or NOAEC) can be determined from the results of a single chronic test. In the case of acute toxicity, NOAEC is defined as no significant difference in lethal concentration between the control and 100 percent effluent.

   c. Bioassay shall be conducted in accordance with Short-Term Methods for Estimating the Chronic Toxicity of Effluent and Receiving Waters to Freshwater Organisms, EPA/600/4-89/001 and Methods for Measuring the Acute Toxicity of Effluents to Aquatic Organisms, EPA (most current edition). Quality assurance criteria, statistical analyses and data reporting for the bioassays shall be in accordance with the EPA document for chronic testing referenced above.

   d. The Permittee shall make available to the Department, on request, the written standard operating procedures they, or the laboratory performing the bioassays, are using for all toxicity tests required by the Department.

   e. An acute bioassay test shall be considered to show toxicity if the NOAEC cannot be demonstrated with 100 percent effluent unless the Permit specifically provides for a Zone of Immediate Dilution (ZID) for biotoxicity. If the Permit specifies such a ZID, acute toxicity shall be indicated when the NOAEC occurs at dilutions greater than that which is found to occur at the edge of the ZID. If toxicity is shown under either of these criteria, another toxicity test using the same species and the same methodology shall be conducted within two weeks of receipt of laboratory results. If the second test also indicates toxicity, the Permittee shall follow the procedure described in section (g) of this Permit condition.

   f. A chronic bioassay test shall be considered to show toxicity if the NOAEC occurs at dilutions greater than that which is known to occur at the edge of the mixing zone, or if there is no dilution data for the edge of the mixing zone and any chronic bioassay test shows a statistically significant effect in 100 percent effluent as compared to the control, another toxicity test using the same species and the same methodology shall be conducted within two weeks from receipt of laboratory results. If the second test also indicates toxicity, the Permittee shall follow the procedure described in section (g) of this Permit condition.

g. If, after following the procedure as described in sections (e) or (f) of this Permit condition, two consecutive bioassay test results indicate acute and/or chronic toxicity, the Permittee shall evaluate the source of the toxicity and submit a plan and time schedule either for demonstrating compliance by conducting a mixing zone analysis or for otherwise achieving compliance with the water quality standards for toxicity. Upon approval by the Department, the Permittee will implement the plan until compliance has been achieved. Evaluations shall be completed and plans submitted within 6 months unless otherwise approved in writing by the Department.

h. If bioassay testing indicates acute and/or chronic toxicity, the Department may reopen and modify this Permit pursuant to OAR 340-45-055 to include new limitations and/or conditions as determined by the Department to be appropriate.

Note A/: Until the existing sewerage facilities are upgraded pursuant to Stipulation and Final Order (WQ-WVR-92-058), bioassays will be conducted on de-chlorinated samples. After upgrade bioassays will be conducted, if necessary, on whole effluent samples.

2. Sludge Management

a. Prior to removal of any accumulated sludge solids from the lagoons, the Permittee shall have submitted and obtained Department approval of a sludge management plan developed in accordance with Administrative rule, Chapter 340, Division 50 "Land Application and Disposal of Sewage Treatment Plant Sludge and Sludge Derived Products including Septage".

b. All sludge shall be managed in accordance with the current sludge management plan approved by the Department of Environmental Quality. No substantial changes shall be made in sludge management activities which significantly differ from operations specified under the approved plan without the prior written approval of the Department.

c. This Permit may be modified to incorporate any applicable standard for sludge use or disposal promulgated under section 405(d) of the Clean Water Act, if the standard for sewage sludge use or disposal is more stringent than any requirements for sludge use or disposal in the Permit, or contains a pollutant or practice not limited in this Permit.

Compliance with the sludge management conditions in this permit, as well as the regulations in OAR 340, Division 50, does not relieve the Permittee from compliance with 40 CFR, Part 503, Federal Regulations.

3. Operator Certification

The permittee shall comply with Oregon Administrative Rules (OAR), Chapter 340, Division 49, "Regulations Pertaining To Certification of Wastewater System Operator Personnel" and accordingly:

a. The Permittee shall have its wastewater system supervised by one or more operators who are certified in a classification and grade level (equal to or greater) that corresponds with the classification (collection and /or treatment) of the system to be supervised as specified on page one of this Permit.

Note: A "supervisor" is defined as the person exercising authority for establishing and executing the specific practice and procedures of operating the system in accordance with the policies of the permittee and requirements of the waste discharge Permit. "Supervise" means responsible for the technical operation of a system, which may affect its performance or the quality of the effluent produced. Supervisors are not required to be on-site at all times.

b. The Permittee's wastewater system may not be without supervision (as required by Special Condition 3.a. above) for more than thirty (30) days. During this period, and at any time that the supervisor is not available to respond on-site (i.e. vacation, sick leave or off-call), the permittee must make available another person who is certified at no less than one grade lower than the system classification.

c. If the wastewater system has more than one daily shift, the Permittee shall have the shift supervisor, if any, certified at no less than one grade lower than the system classification.

d. The Permittee is responsible for ensuring the wastewater system has a properly certified supervisor available at all times to respond on-site at the request of the permittee and to any other operator.

e. The Permittee shall notify the Department of Environmental Quality in writing within thirty (30) days of replacement or redesignation of certified operators responsible for supervising wastewater system operation (including shifts). The notice shall be filed with the Water Quality Division, Operator Certification Program (see address on page one). This requirement is in addition to the reporting requirements contained under Schedule B of this Permit.

f. Upon written request, the Department may grant the Permittee reasonable time, not to exceed 120 days, to obtain the services of a qualified person to supervise the wastewater system. The written request must include justification for the time needed, a schedule for recruiting and hiring, the date the system supervisor availability ceased and the name of the alternate system supervisor(s) as is required by 3.b. above.

4. The Permittee shall notify the DEQ Willamette Valley Region office (phone 378-8240), in accordance with the response times noted in the General Conditions of this Permit, of any malfunction so corrective action can be coordinated between the Permittee and the Department.

NPDES GENERAL CONDITIONS

SECTION A. STANDARD CONDITIONS

1. Duty to Comply

The permittee must comply with all conditions of this permit. Any permit noncompliance constitutes a violation of Oregon Revised Statutes (ORS) 468.720 and is grounds for enforcement action; for permit termination, suspension, or modification; or for denial of a permit renewal application.

2. Penalties for Violations of Permit Conditions

Oregon Law (ORS 468.140) allows the Director to impose civil penalties up to $10,000 per day for violation of a term, condition, or requirement of a permit.

In addition, Oregon Law (ORS 468.990) classifies a willful or negligent violation of the terms of a permit or failure to get a permit as a misdemeanor and a person convicted thereof shall be punishable by a fine of not more than $25,000 or by imprisonment for not more than one year, or by both. Each day of violation constitutes a separate offense.

3. Duty to Mitigate

The permittee shall take all reasonable steps to minimize or prevent any discharge or sludge use or disposal in violation of this permit which has a reasonable likelihood of adversely affecting human health or the environment. In addition, upon request of the Department, the permittee shall correct any adverse impact on the environment or human health resulting from noncompliance with this permit, including such accelerated or additional monitoring as necessary to determine the nature and impact of the noncomplying discharge.

4. Duty to Reapply

If the permittee wishes to continue an activity regulated by this permit after the expiration date of this permit, the permittee must apply for and have the permit renewed. The application shall be submitted at least 180 days before the expiration date of this permit.

The Director may grant permission to submit an application less than 180 days in advance but no later than the permit expiration date.

5. Permit Actions

This permit may be modified, suspended, revoked and reissued, or terminated for cause including, but not limited to, the following:

a. Violation of any term, condition, or requirement of this permit, a rule, or a statute;

b. Obtaining this permit by misrepresentation or failure to disclose fully all material facts; or

c. A change in any condition that requires either a temporary or permanent reduction or elimination of the authorized discharge.

The filing of a request by the permittee for a permit modification or a notification of planned changes or anticipated noncompliance, does not stay any permit condition.

6. Toxic Pollutants

The permittee shall comply with any applicable effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants within the time provided in the regulations that establish those standards or prohibitions, even if the permit has not yet been modified to incorporate the requirement.

7. Property Rights

The issuance of this permit does not convey any property rights of any sort, or any exclusive privilege.

8. Permit References

Except for effluent standards or prohibitions established under Section 307(a) of the Clean Water Act for toxic pollutants and standards for sewage sludge use or disposal established under Section 405(d) of the Clean Water Act, all rules and statutes referred to in this permit are those in effect on the date this permit is issued.

SECTION B. OPERATION AND MAINTENANCE OF POLLUTION CONTROLS

1. Proper Operation and Maintenance

The permittee shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the permittee to achieve compliance with the conditions of this permit. Proper operation and maintenance also includes adequate laboratory controls, and appropriate quality assurance procedures. This provision requires the operation of back-up or auxiliary facilities or similar systems which are installed by a permittee only when the operation is necessary to achieve compliance with the conditions of the permit.

2. Duty to Halt or Reduce Activity

For industrial or commercial facilities, upon reduction, loss, or failure of the treatment facility, the permittee shall, to the extent necessary to maintain compliance with its permit, control production or all discharges or both until the facility is restored or an alternative method of treatment is provided. This requirement applies, for example, when the primary source of power of the treatment facility fails or is reduced or lost. It shall not be a defense for a permittee in an enforcement action that it would have been necessary to halt or reduce the permitted activity in order to maintain compliance with the conditions of this permit.

3. Bypass of Treatment Facilities

a. Definitions

(1) "Bypass" means intentional diversion of waste streams from any portion of the treatment facility. The term "bypass" does not include nonuse of singular or multiple units or processes of a treatment works when the nonuse is insignificant to the quality and/or quantity of the effluent produced by the treatment works. The term "bypass" does not apply if the diversion does not cause effluent limitations to be exceeded, provided the diversion is to allow essential maintenance to assure efficient operation.

(2) "Severe property damage" means substantial physical damage to property, damage to the treatment facilities or treatment processes which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of a bypass. Severe property damage does not mean economic loss caused by delays in production.

b. Prohibition of bypass.

(1) Bypass is prohibited unless:

(a) Bypass was necessary to prevent loss of life, personal injury, or severe property damage;

(b) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This condition is not satisfied if adequate backup equipment should have been installed in the exercise of reasonable engineering judgement to prevent a bypass which occurred during normal periods of equipment downtime or preventative maintenance; and

(c) The permittee submitted notices and requests as required under paragraph c of this section.

(2) The Director may approve an anticipated bypass, after considering its adverse effects and any alternatives to

bypassing, when the Director determines that it will meet the three conditions listed above in paragraph b(1) of this section.

c. Notice and request for bypass.

(1) Anticipated bypass. If the permittee knows in advance of the need for a bypass, it shall submit prior written notice, if possible at least ten days before the date of the bypass.

(2) Unanticipated bypass. The permittee shall submit notice of an unanticipated bypass as required in Section D, Paragraph D-5.

4. Upset

a. Definition. "Upset" means an exceptional incident in which there is unintentional and temporary noncompliance with technology based permit effluent limitations because of factors beyond the reasonable control of the permittee. An upset does not include noncompliance to the extent caused by operation error, improperly designed treatment facilities, inadequate treatment facilities, lack of preventative maintenance, or careless or improper operation.

b. Effect of an upset. An upset constitutes an affirmative defense to an action brought for noncompliance with such technology based permit effluent limitations if the requirements of Section B.4.c. of these General Conditions are met. No determination made during administrative review of claims that non-compliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

c. Conditions necessary for a demonstration of upset. A permittee who wishes to establish the affirmative defense of upset shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence that:

(1) An upset occurred and that the permittee can identify the causes(s) of the upset;

(2) The permitted facility was at the time being properly operated; and

(3) The permittee submitted notice of the upset as required in Section D.5., hereof (24-hour notice).

(4) The permittee complied with any remedial measures required under Section A.3 hereof.

d. Burden of proof. In any enforcement proceeding the permittee seeking to establish the occurrence of an upset has the burden of proof.

5. Treatment of Single Operational Event

For purposes of this permit, A Single Operational Event which leads to simultaneous violations of more than one pollutant parameter shall be treated as a single violation. A single operational event is an exceptional incident which causes simultaneous, unintentional, unknowing (not the result of a knowing act or omission), temporary noncompliance with more than one Clean Water Act effluent discharge pollutant parameter. A single operational event does not include Clean Water Act violations involving discharge without an NPDES permit or noncompliance to the extent caused by improperly designed or inadequate treatment facilities. Each day of a single operational event is a violation.

6. Overflows from Wastewater Conveyance Systems and Associated Pump Stations

a. Definitions

(1) "Overflow" means the diversion and discharge of waste streams from any portion of the wastewater conveyance system including pump stations, through a designed overflow device or structure, other than discharges to the wastewater treatment facility.

(2) "Severe property damage" means substantial physical damage to property, damage to the conveyance system or pump station which causes them to become inoperable, or substantial and permanent loss of natural resources which can reasonably be expected to occur in the absence of an overflow.

(3) "Uncontrolled overflow" means the diversion of waste streams other than through a designed overflow device or structure, for example to overflowing manholes or overflowing into residences, commercial establishments, or industries that may be connected to a conveyance system.

b. Prohibition of overflows. Overflows are prohibited unless:

(1) Overflows were unavoidable to prevent an uncontrolled overflow, loss of life, personal injury, or severe property damage; and

(2) There were no feasible alternatives to the overflows, such as the use of auxiliary pumping or conveyance systems, or maximization of conveyance system storage; and

(3) The overflows are the result of an upset as defined in Condition B4 and meeting all requirements of this condition.

c. Uncontrolled overflows are prohibited where wastewater is likely to escape or be carried into the waters of the State by any means.

d. Reporting required. Unless otherwise specified in writing by the Department, all overflows and uncontrolled overflows must be reported orally to the Department within 24 hours from the time the permittee becomes aware of the overflow. Reporting procedures are described in more detail in Condition D.5.

7. Public Notification of Effluent Violation or Overflow

If effluent limitations specified in this permit are exceeded or an overflow occurs, upon request by the Department, the permittee shall take such steps as are necessary to alert the public about the extent and nature of the discharge. Such steps may include, but are not limited to, posting of the river at access points and other places, news releases, and paid announcements on radio and television.

8. Removed Substances

Solids, sludges, filter backwash, or other pollutants removed in the course of treatment or control of wastewaters shall be disposed of in such a manner as to prevent any pollutant from such materials from entering public waters, causing nuisance conditions, or creating a public health hazard.

SECTION C. MONITORING AND RECORDS

1. Representative Sampling

Sampling and measurements taken as required herein shall be representative of the volume and nature of the monitored discharge. All samples shall be taken at the monitoring points specified in this permit and shall be taken, unless otherwise specified, before the effluent joins or is diluted by any other waste stream, body of water, or substance. Monitoring points shall not be changed without notification to and the approval of the Director.

2. Flow Measurements

Appropriate flow measurement devices and methods consistent with accepted scientific practices shall be selected and used to insure the accuracy and reliability of measurements of the volume of monitored discharges. The devices shall be installed, calibrated and maintained to insure that the accuracy of the measurements is consistent with the accepted capability of that type of device. Devices selected shall be capable of measuring flows with a maximum deviation of less than ± 10 percent from true discharge rates throughout the range of expected discharge volumes.

3. Monitoring Procedures

Monitoring must be conducted according to test procedures approved under 40 CFR Part 136, unless other test procedures have been specified in this permit.

4. Penalties of Tampering

The Clean Water Act provides that any person who falsifies, tampers with, or knowingly renders inaccurate, any monitoring device or method required to be maintained under this permit shall, upon conviction, be punished by a fine of not more than $10,000 per violation, or by imprisonment for not more than two years, or by both. If a conviction of a person is for a violation committed after a first conviction of such person, punishment is a fine not more than $20,000 per day of violation, or by imprisonment of not more than four years or both.

5. Reporting of Monitoring Results

Monitoring results shall be summarized each month on a Discharge Monitoring Report form approved by the Department. The reports shall be submitted monthly and are to be mailed, delivered or otherwise transmitted by the 15th day of the following month unless specifically approved otherwise in Schedule B of this permit.

6. Additional Monitoring by the Permittee

If the permittee monitors any pollutant more frequently than required by this permit, using test procedures approved under 40 CFR 136 or as specified in this permit, the results of this monitoring shall be included in the calculation and reporting of the data submitted in the DMR. Such increased frequency shall also be indicated. For a pollutant parameter that may be sampled more than once per day (e.g., Total Chlorine Residual), only the average daily value shall be recorded unless otherwise specified in this permit.

7. Averaging of Measurements

Calculations for all limitations which require averaging of measurements shall utilize an arithmetic mean, except for bacteria which shall be averaged based on a geometric or log mean.

8. Retention of Records

The permittee shall retain records of all monitoring information, including all calibration and maintenance records of all original strip chart recordings for continuous monitoring instrumentation, copies of all reports required by this permit, and records of all data used to complete the application for this permit, for a period of at least 3 years from the date of the sample, measurement, report or application. This period may be extended by request of the Director at any time.

9. Records Contents

Records of monitoring information shall include:

a. The date, exact place, time and methods of sampling or measurements;

b. The individual(s) who performed the sampling or measurements;

c. The date(s) analyses were performed;

d. The individual(s) who performed the analyses;

e. The analytical techniques or methods used; and

f. The results of such analyses.

10. Inspection and Entry

The permittee shall allow the Director, or an authorized representative upon the presentation of credentials to:

a. Enter upon the permittee's premises where a regulated facility or activity is located or conducted, or where records must be kept under the conditions of this permit;

b. Have access to and copy, at reasonable times, any records that must be kept under the conditions of this permit;

c. Inspect at reasonable times any facilities, equipment (including monitoring and control equipment), practices, or operations regulated or required under this permit, and

d. Sample or monitor at reasonable times, for the purpose of assuring permit compliance or as otherwise authorized by state law, any substances or parameters at any location.

SECTION D. REPORTING REQUIREMENTS

1. Planned Changes

The permittee shall comply with Oregon Administrative Rules (OAR) 340, Division 52, "Review of Plans and Specifications". Except where exempted under OAR 340-52, no construction, installation, or modification involving disposal systems, treatment works, sewerage systems, or common sewers shall be commenced until the plans and specifications are submitted to and approved by the Department. The permittee shall give notice to the Department as soon as possible of any planned physical alternations or additions to the permitted facility.

2. Anticipated Noncompliance

The permittee shall give advance notice to the Director of any planned changes in the permitted facility or activity which may result in noncompliance with permit requirements.

3. Transfers

This permit may be transferred to a new permittee provided the transferee acquires a property interest in the permitted activity and agrees in writing to fully comply with all the terms and conditions of the permit and the rules of the Commission. No permit shall be transferred to a third party without prior written approval from the Director. The permittee shall notify the Department when a transfer of property interest takes place.

4. Compliance Schedule

Reports of compliance or noncompliance with, or any progress reports on interim and final requirements contained in any compliance schedule of this permit shall be submitted no later than 14 days following each schedule date. Any reports of noncompliance shall include the cause of noncompliance, any remedial actions taken, and the probability of meeting the next scheduled requirements.

5. Twenty-Four Hour Reporting

The permittee shall report any noncompliance which may endanger health or the environment. Any information shall be provided orally (by telephone) within 24 hours from the time the permittee becomes aware of the circumstances. During normal business hours, the Department's Regional office shall be called. Outside of normal business hours, the Department shall be contacted at 1-800-452-0311 (Oregon Accident Response System). A written submission shall also be provided within 5 days of the time the permittee becomes aware of the circumstances. The written submission shall contain:

a. A description of the noncompliance and its cause;

b. The period of noncompliance, including exact dates and times;

c. The estimated time noncompliance is expected to continue if it has not been corrected; and

d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

e. Public notification steps taken, pursuant to General Condition B-7.

The following shall be included as information which must be reported within 24 hours under this paragraph:

a. Any unanticipated bypass which exceeds any effluent limitation in this permit.

b. Any upset which exceeds any effluent limitation in the permit.

c. Violation of maximum daily discharge limitation for any of the pollutants listed by the Director in the permit.

The Department may waive the written report on a case-by-case basis if the oral report has been received within 24 hours.

6. Other Noncompliance

The permittee shall report all instances of non-compliance not reported under Section D4 or D5, at the time monitoring reports are submitted. The reports shall contain:

a. A description of the noncompliance and its cause;

b. The period of noncompliance, including exact dates and times;

c. The estimated time noncompliance is expected to continue if it has not been corrected; and

d. Steps taken or planned to reduce, eliminate, and prevent reoccurrence of the noncompliance.

7. Duty to Provide Information

The permittee shall furnish to the Department, within a reasonable time, any information which the Department may request to determine compliance with this permit. The permittee shall also furnish to the Department, upon request, copies of records required to be kept by this permit.

Other Information: When the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or any report to the Department, it shall promptly submit such facts or information.

8. Signatory Requirements

All applications, reports or information submitted to the Department shall be signed and certified in accordance with 40 CFR 122.22.

9. Falsification of Reports

State law provides that any person who knowingly makes any false statement, representation, or certification in any record or other document submitted or required to be maintained under this permit, including monitoring reports or reports of compliance or noncompliance shall, upon conviction be punished by a fine of not more than $1,000 per violation, or by imprisonment for not more than six months per violation, or by both.

10. Changes to Indirect Dischargers - **[Applicable to Publicly Owned Treatment Works (POTW) only]**

The permittee must provide adequate notice to the Department of the following:

a. Any new introduction of pollutants into the POTW from an indirect discharger which would be subject to section 301 or 306 of the Clean Water Act if it were directly discharging those pollutants and;

b. Any substantial change in the volume or character of pollutants being introduced into the POTW by a source introducing pollutants into the POTW at the time of issuance of the permit.

c. For the purposes of this paragraph, adequate notice shall include information on (i) the quality and quantity of effluent introduced into the POTW, and (ii) any anticipated impact of the change on the quantity or quality of effluent to be discharged from the POTW.

SECTION E. DEFINITIONS

1. BOD means five-day biochemical oxygen demand.

2. TSS means total suspended solids (non-filterable residue).

3. Mg/l means milligrams per liter.

4. Kg means kilograms.

5. M^3/d means cubic meters per day.

6. MGD means million gallons per day.

7. Composite sample means a sample formed by collecting and mixing discrete samples taken periodically and based on time or flow.

8. FC means fecal coliform bacteria.

9. Technology based permit effluent limitations means technology-based treatment requirements as defined in 40 CFR 125.3, and concentration and mass load effluent limitations that are based on minimum design criteria specified in OAR 340-41.

10. CBOD means five day carbonaceous biochemical oxygen demand.

11. Grab sample means an individual discrete sample collected over a period of time not to exceed 15 minutes.

12. Quarter means January through March, April through June, July through September, or October through December.

13. Month means calendar month.

14. Week means a calendar week of Sunday through Saturday.

15. Total residual chlorine means combined chlorine forms plus free residual chlorine.

16. The term "bacteria" includes but is not limited to fecal coliform bacteria, total coliform bacteria, and enterococci bacteria.

17. POTW means a publicly owned treatment works.

Appendix B
Stipulation and Final Order

Oregon
DEPARTMENT OF
ENVIRONMENTAL
QUALITY

RECEIVED
JUL 2 1992
CITY OF DALLAS

June 30, 1992

City of Dallas
Mr. Roger Jordan - City Manager
P.O. Box 67
Dallas, Oregon 97338

Re: Stipulation and Final Order

Dear Mr. Jordan:

Fred Hansen, Department Director, has signed the Stipulation and Final Order (SFO) issued for the City of Dallas. Your copy of the signed SFO is enclosed.

As the SFO is now in effect, the Department encourages you to become familiar with the conditions and schedule of the Order to ensure compliance. If you have any questions, please contact Mr. Richard Santner at 229-5219 or Sharon Hays at 229-6796.

Sincerely,

Sharon M. Hays

Sharon M. Hays
Municipal Projects Section
Water Quality Division

SMH
Enclosure
cc: Willamette Valley Region
CH$_2$M Hill - Mr. Jim Smith
Teresa Green - EPA WOO
Van Kolias - DEQ
Richard Santner - DEQ
Darlene Hoge - DEQ
Permit file

811 SW Sixth Avenue
Portland, OR 97204-1390
(503) 229-5696
TDD (503) 229-6993

BEFORE THE ENVIRONMENTAL QUALITY COMMISSION
OF THE STATE OF OREGON

DEPARTMENT OF ENVIRONMENTAL QUALITY, ORDER OF THE STATE OF OREGON, Department, v. CITY OF DALLAS Respondent.	)	STIPULATION AND FINAL No. WQ-WVR-92-058 POLK COUNTY

WHEREAS:

1. On August 22, 1984, the Department of Environmental Quality (Department or DEQ) issued National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit Number 3872-J (Permit) to the City of Dallas (Respondent). The Permit authorizes the Respondent to construct, install, modify or operate wastewater treatment control and disposal facilities (facilities) and discharge adequately treated wastewaters into Rickreall Creek, waters of the state, in conformance with the requirements, limitations and conditions set forth in the Permit. The Permit expired on July 31, 1989.

2. On March 6, 1989, the Department received an application from Respondent to renew the Permit. Pursuant to Oregon Revised Statute (ORS) 183.430, the Permit will remain in effect past its stated expiration date until DEQ issues a formal order granting or denying such renewal.

3. DEQ intends to renew the NPDES Waste Discharge Permit

to Respondent, pursuant to ORS 468.740 and the Federal Water Pollution Control Act Amendments of 1972, P.L. 92-500. Until Respondent upgrades the sewerage facility, it is unlikely the Respondent will be able to consistently meet discharge limitations in the renewed Permit.

4. Because of very high quantities of infiltration and inflow (I/I) into the Respondent's sewage collection system and because of inadequate sewage treatment facilities, during wet weather, the Respondent's main pump station at the sewage treatment plant discharges untreated, raw sewage into Rickreall Creek. Generally, when the peak flow rate of raw sewage entering the pump station exceeds 4,000 gallons per minute (gpm), the flow in excess of 4,000 gpm is discharged to the creek. If excess flows were not bypassed, the hydraulic load on the sewage treatment plant would cause the plant's biological solids to wash out of the system rendering the plant unable to effectively treat wastewater for several days. Discharges of untreated sewage violate federal minimum secondary treatment standards (40 CFR, Part 133).

5. Under certain seasonal conditions, the Respondent's discharge likely violates water quality standards for chronic toxicity and other parameters in Rickreall Creek outside the allowable mixing zone specified in the Permit. The discharge also likely creates acute toxicity in Rickreall Creek inside the mixing zone beyond the zone of immediate dilution. Such

conditions would violate water quality standards for allowable mixing zones (Oregon Administrative Rule 340-41-245) and violate the Permit condition that specifies an allowable mixing zone. Potential toxicity is caused by total chlorine residual remaining in the effluent after the disinfection process. Chlorine is used to reduce fecal coliform bacteria levels in the treated effluent as necessary to meet Permit limits for fecal coliform.

6. DEQ and the Respondent recognize that until new or modified facilities are constructed and put into full operation, Respondent will continue, at times, to violate permit effluent limitations and water quality standards in Rickreall Creek.

7. Respondent presently is capable of treating up to 4,000 gpm of its influent raw wastewater so as to meet the following effluent limitations, measured as specified in the Permit:

A May 1 - October 31:

Concentration and Mass Load Limitations

Parameter	Average Effluent Concentrations Monthly	Average Effluent Concentrations Weekly	Monthly Average lb/day	Weekly Average lb/day	Daily Maximum lbs
BOD-5	10 mg/l	15 mg/l	167	250	334
TSS	10 mg/l	15 mg/l	167	250	334
FC/100 ml	200	400			

B November 1 - April 30:

Concentration and Mass Load Limitations

Parameter	Average Effluent Concentrations Monthly	Average Effluent Concentrations Weekly	Monthly Average lb/day	Weekly Average lb/day	Daily Maximum lbs
BOD-5	20 mg/l	30 mg/l	334	500	600
TSS	20 mg/l	30 mg/l	334	800	1100
FC/100 ml	200	400			

C Other Parameters (year-around)

(1) Ph - Shall be within the range 6.0 - 9.0

(2) BOD-5/TSS Removal Efficiency - No Limit

(3) Total Chlorine Residual - Shall not exceed a monthly average of 1.0 mg/l or a daily maximum of 2.0 mg/l.

D Other Discharge Limits

For any month when, because of excessive infiltration and inflow (I/I), a daily flow entering the treatment facility exceeds 2.0 MGD, the loadings discharged may exceed the mass load limitations in Paragraph 7A and/or 7B. During those periods, the amount of BOD5 and TSS discharged shall not exceed a monthly average of 970 lbs/day each, or a daily maximum of 1450 lbs. each.

8. The Department and Respondent recognize that the Environmental Quality Commission has the power to impose a civil penalty and to issue an abatement order for violations of conditions of the Permit. Therefore, pursuant to ORS 183.415(5), the Department and Respondent wish to resolve the

past and future violations referred to in Paragraphs 3, 4, 5, and 6 by this Stipulation and Final Order.

9. This Stipulation and Final Order is not intended to limit, in any way, the Department's right to proceed against Respondent in any forum for any past or future violations not expressly settled herein.

NOW THEREFORE, it is stipulated and agreed that:

10. The Environmental Quality Commission shall issue a final order:

A. Requiring Respondent to comply with the following schedule:

(1) By no later than July 31, 1992, the Respondent shall submit a plan to the Department for notifying the public during periods of discharge of untreated sewage. The plan shall include procedures to be followed by the Respondent during periods of discharge of untreated sewage. The plan should include appropriate provisions for, but not be limited to, stream sampling for fecal coliform, posting of warning signs and other public notification steps. In addition, the plan shall include contingency plans for minimizing the flow of raw or partially treated sewage.

(2) By no later than July 31, 1993, the Respondent shall submit to the Department a comprehensive draft Sewerage Facilities Plan for Department and other agency review that evaluates and proposes a selected alternative for a new sewerage facility. The new sewerage facility shall comply with applicable current state and federal design and operational requirements, and its discharge shall not violate current water quality standards. (The facility planning schedule for the City of Dallas is predicated on the Department's establishment of comprehensive waste discharge limits for Rickreall Creek and Willamette River by November 15, 1992. The waste discharge limits will form the basis for evaluating options and implementing the required new facilities, such that the Respondent's treated discharge will not violate current water quality standards. The Respondent will primarily be responsible for proposing waste discharge limits for the option of the Respondent to discharge treated effluent to Rickreall Creek with the Department participating in stream data base collection and methodology review. The Department will primarily be responsible for developing waste discharge limits for the option of the Respondent to discharge treated

effluent to the Willamette River.)

(3) Within ten (10) months of the issuance of a permit by the Department for the proposed new facilities, the Respondent shall acquire financing for, prepare and submit to the Department for review the Final Plans and Specifications for the new facilities.

(4) Within thirty (30) months of Departmental approval of the Final Plans and Specifications for the new facilities, the Respondent shall attain operational level of the facility and meet permit limits.

B. Requiring Respondent to submit to the Department by no later than January 15 of each year an annual report summarizing the Respondent's progress toward achieving the schedule.

C. Requiring Respondent to meet the interim effluent limitations set forth in Paragraph 7 above until such time as the condition described in Paragraph 10 (A)(4) is satisfied.

D. Allowing Respondent, until such time as the condition in Paragraph 10 (A)(4) is satisfied, to violate water quality standards in Rickreall Creek provided Respondent meets the limits in Paragraph 7.

E. Allowing Respondent, until such time as the condition in Paragraph 10 (A)(4) is satisfied, to discharge raw, untreated sewage that is in excess of an instantaneous flow of 4,000 gpm provided:

(1) The sewerage facility shall be operated as effectively as practicable to minimize discharges of untreated sewage,

(2) Incoming sewage that is not in excess of an instantaneous flow of 4,000 gpm shall be treated and meet the effluent limitations of Paragraph 7, and

(3) The Respondent fully implements the approved schedule required in Paragraph 10A.

F. Requiring Respondent, upon receipt of a written notice from the Department for any violations of the Stipulation and Final Order, to pay the following civil penalties:

(a) $250 for each day of each violation of the compliance schedule set forth in Paragraph 10.

(b) $100 for each violation of each interim discharge limit set forth in Paragraph 7 or any other requirement of the Stipulation and Final Order.

11. If any event occurs that is beyond Respondent's reasonable control and that causes or may cause a delay or deviation in performance of the requirements of this

Stipulation and Final Order, Respondent shall immediately notify the Department verbally of the cause of delay or deviation and its anticipated duration, the measures that have been or will be taken to prevent or minimize the delay or deviation, and the timetable by which Respondent proposes to carry out such measures. Respondent shall confirm in writing this information within five (5) working days of the onset of the event. It is Respondent's responsibility in the written notification to demonstrate to the Department's satisfaction that the delay or deviation has been or will be caused by circumstances beyond the control and despite due diligence of Respondent. If Respondent so demonstrates, it shall not be in violation of this SFO and the Department shall waive enforcement actions defined above in Paragraph 10F and shall extend times of performance of related activities under the Stipulation and Final Order as appropriate. Circumstances or events which are beyond Respondent's control may include, but are not limited to, acts of nature; unforeseen strikes; work stoppages; fires; explosion; riot; sabotage; war; unforeseen equipment breakdowns when the cause was beyond the Respondent's reasonable control or changes in State statute which may delay or limit the opportunity of the City to obtain voter approval for the sale of bonds. Such circumstances or events may also include substantial reductions or delays in the receipt of awarded state or federal grants or loans where the reductions or delays are not due to actions or inactions of the Respondent. Furthermore, in the event of unforeseen delays resulting from failed attempts to obtain financing, if the City demonstrates it has acted in good faith and with due diligence, the Department shall consider waiving any resulting violation of this SFO and enforcement action under Paragraph 10F. It may also include substantial increased costs from unforeseen problems or delays that Respondent or its consultant would not likely have been expected to anticipate. These unforeseen problems may include, but are not limited to, the Department's delay in determining the applicable waste discharge limits for the City of Dallas for Rickreall Creek and Willamette River, along with institutional difficulties in acquiring necessary lands, permits, easements, rights-of-way, interagency/private entity agreements and/or approvals which are critical to implementing the required new facilities. A consultant's failure to provide timely reports shall not be considered circumstances beyond Respondent's control unless the delays are due to the actions or inactions of others not under the control of Respondent or Respondent's consultant.

12. Regarding the violations set forth in Paragraphs 3, 4, 5 and 6 above, which are expressly settled herein without penalty, Respondent and the Department hereby waive any and

all of their rights to any and all notices, hearing, judicial review, and to service of a copy of the final order herein. The Department reserves the right to enforce this order through appropriate administrative and judicial proceedings.

13. Stipulated, civil penalties specified in Paragraph 10F shall be due upon receipt by Respondent of a written demand by the Department for payment of such penalties. Penalties shall be paid by check or money order made payable to "State Treasurer, State of Oregon" and delivered to the Department. Respondent may request a contested case hearing regarding any alleged noncompliance with this Order that results in a demand payment for stipulated, civil penalties; however stipulated, civil penalty amounts may not be contested. Further, penalties regarding the alleged noncompliance with this agreement may accrue pending any contested case regarding the alleged violation.

14. Respondent acknowledges that Respondent is responsible for upgrading its sewerage facilities regardless of the availability of any federal or state grant or loan monies.

15. The terms of this Stipulation and Final Order may be amended by the mutual agreement of the Department and Respondent.

16. Respondent acknowledges that it has actual notice of the contents and requirements of the Stipulation and Final Order and that failure to fulfill any of the requirements

hereof would constitute a violation of this Stipulation and Final Order and subject Respondent to payment of civil penalties pursuant to Paragraph 10F above.

17. This Stipulation and Final Order shall terminate 60 days after Respondent demonstrates full compliance with the requirements of the schedule set forth in Paragraph 10A above.

RESPONDENT

June 15, 1992
Date

Gwen Van Den Bosch
(Name) Gwen VanDenBosch
(Title) Mayor

Roger Jordan
(Name) Roger Jordan
(Title) City Manager

DEPARTMENT OF ENVIRONMENTAL QUALITY

June 30, 1992
Date

Fred Hansen
Fred Hansen, Director

FINAL ORDER

IT IS SO ORDERED:

ENVIRONMENTAL QUALITY COMMISSION

June 30, 1992
Date

Fred Hansen
Fred Hansen, Director
Department of Environmental Quality
Pursuant to OAR 340-11-136(1)

Appendix C
Liquid Treatment Design Information

Table C-1 Flow Conditions			
Design Category	**Design Basis**	**Total Plant Influent Flow (mgd)**	
		Current (1995)	**Future (2020)**
Hydraulic Design	Dry Weather Average Daily Flow (DWADF)	1.6	
	Wet Weather Peak Instantaneous Flow Rate (WWPIF)		16.13
Process Design[a]	Dry Weather Maximum Month Average Daily Flow (DWMMADF)		3.07
	Wet Weather Maximum Month Average Daily Flow (WWMMADF)		7.39

[a] The limiting flow for process design depends on process loadings.

Table C-2 Influent Pumping Design Information - All Options			
Item		**Description**	
Influent Pumping			
Physical/Structural Facilities (Tankage, Buildings, etc.)			
Wet well Length Width Depth		40 feet 10 feet 20 feet	
Pump dry well Length Width Depth		40 feet 10 feet 20 feet (below grade)	
Motor Room Length Width Height		50 feet 20 feet 15 feet (above grade)	
Major Mechanical Equipment			
INFLUENT PUMPS			
Design flow		Future WWPIF (16.13 mgd)	
TDH		45 feet	
Pump type		Dry pit centrifugal	
Quantity	*Flow Range (mgd)*	*Drive Type*	*Motor Size (hp)*
2	0-2.3	Adjustable speed	30
3	4	Constant speed	50
1	0-4	Adjustable speed	50
Redundancy		1 redundant pump at design flow	

Table C-3 Screening Design Information - All Options		
Item		**Description**
Screening		
Physical/Structural Facilities (Tankage, Buildings, etc.)		
Channel/scrn width Mechanical (2) Manual (1)		1 foot, each 2.5 feet
Channel depth (all channels)		3 feet
Condition	*Upstream Water Depth*	*Approach Velocity (fps)*
Current DWADF (1.6 mgd), 1 mechanical screen in service	2 feet	1.24
Future WWMMADF (7.39 mgd), both mechanical screens in service	2.4 feet	2.40
Future WWPIF (16.13 mgd), all 3 screens in service	2.4 feet	2.48
Major Mechanical Equipment		
BAR SCREENS		
Type		Vertical bar with intermittent rake
Number of units		2 mechanical (1 foot wide) 1 manual (2.5 feet wide) 3 total
Opening size		1/2 inch
Bar width		3/4 inch

Table C-4
Aeration Design Information

Item	System Option (1) No Discharge Winter Storage/ Summer Irrigation	(2) Rickreall discharge/ Summer irrigation	(3) Willamette discharge/ Demand irrigation	(4) Year-Round Rickreall Discharge
Aeration				
Physical/Structural Facilities (Tankage, Buildings, etc.)				
ACTIVATED SLUDGE TANKAGE				
Type	Anoxic Selector	Nitrogen Removal	Anoxic Selector	BNR
DW active volume (MG)	0.5	1	0.5	1
Total tank volume = WW active volume (MG)	1.5	2	1.5	2.5
Number of units DW	1	2	1	2
WW/Total	3	4	3	5
Length (feet)	200	200	200	200
Width (feet)	20	20	20	20
Side water depth (feet)	16.75	16.75	16.75	16.75
Nominal total HRT DW	3.9 h	7.8 h	3.9 h	7.8 h
WW	4.9 h	6.5 h	4.9 h	8.1 h
Nominal anaerobic HRT	N/A			60 mins at WWMMADF
Nominal anoxic HRT	30 mins at WWMMADF	60 mins at WWMMADF	30 mins at WWMMADF	60 mins at WWMMADF
Total number of anaerobic plus anoxic compartments per unit	1	2	1	4
Sludge age or SRT DW	5 d	12 d	5 d	13 d
WW	12 d	17 d	12 d	22 d
MLSS (mg/L) DW	2,875	2,914	2,875	3,087
WW	2,992	3,030	2,992	2,962
F/M ratio (d^{-1}) DW	0.44	0.23	0.44	0.21
WW	0.19	0.14	0.19	0.12
RAS flow rate DW	3.0 mgd (approx. 1Q)[a]			
WW	7.3 mgd (approx. 1Q)			
MLR flow rate	N/A	1Q-4Q	N/A	1Q-4Q
BLOWER BUILDING				
Length (feet)	75	90	75	75
Width	35 feet			
Height	20 feet			
Major Mechanical Equipment				
AERATION EQUIPMENT				
Oxygen reqmt. (lb/d) DW	4,127	5,031	4,127	5,100
WW	4,869	5,905	4,869	6,146
Aeration type	Fine bubble membrane diffusers			

[a] Q = Secondary treatment influent flow rate

Table C-4 Aeration Design Information				
	System Option			
Item	(1) No Discharge Winter Storage/ Summer Irrigation	(2) Rickreall discharge/ Summer irrigation	(3) Willamette discharge/ Demand irrigation	(4) Year-Round Rickreall Discharge
Assumed standard oxygen transfer efficiency, SOTE (%)	30			
Temperature (°C)	DW: 24°C, WW: 13°C			
Blower cap. (scfm) DW WW	1,618 2,029	1,973 2,460	1,618 2,029	2,000 2,562
Blower pressure (psig)	10			
Blower type	Centrifugal multi-stage			
Number of blowers (including one redundant blower)	3	3	3	3
Capacity, each (scfm)	1,000	1,250	1,000	1,250
Turndown	5:1			
Motor size, each (hp)	75	100	75	100
ANAEROBIC/ANOXIC MIXERS				
Type	Submersible			
Number of units	3	8	3	16
Max. clean water pumping capacity, each (gpm)	8,700			
Motor size, each (hp)	7.5			
MLR PUMPS				
Type		Mixed Flow		Mixed flow
Number of units	N/A	4	N/A	5
Max. capacity, each (mgd)		7.4		5.9
TDH (feet)		10		10
Drive type		Constant Speed		Constant Speed
Motor size, each (hp)		20		15
SODIUM CARBONATE FEED EQUIPMENT (ALKALINITY FOR NITRIFICATION)				
Bulk dry storage (lb/30 days)	N/A	69,250	N/A	69,250
Dry feeder Capacity (lb/d) Turndown		5,500 17:1		5,500 17:1
LIQUID ALUM FEED EQUIPMENT				
Bulk storage tanks Quantity Tot. cap. Material	N/A			1 18,000 gal/ 30 days FRP
Metering pumps Type Quantity Cap., ea. TDH Size, ea.				Prog. cav. 4 0.5 gpm 35 feet 0.01 hp

Table C-5
Secondary Clarification Design Information

Item	System Option (1) No Discharge Winter Storage/ Summer Irrigation	(2) Rickreall discharge/ Summer irrigation	(3) Willamette discharge/ Demand irrigation	(4) Year-Round Rickreall Discharge
Secondary Clarification				
Physical/Structural Facilities (Tankage, Buildings, etc.)				
CLARIFIER TANKAGE				
Type	Circular			
Number of units	2	3		
Diameter (feet)	105	85		
Total area, all units (ft^2)	17,318	17,024		
Side water depth	14 feet			
SOR, all units in service (gpd/ft^2) (500/1,000 max.) Future WWMMADF Future WWPIF	422 921	430 938		
Area with largest unit out of service (ft^2)	8,659	11,349		
Redundancy area requirement with largest unit out of service (ft^2)	7,390 (Class 2: 50 percent of design capacity)	11,085 (Class 1: 75 percent of design capacity)		
SLR, all units in service ($lb/d/ft^2$) (25 max.) Future DWMMADF Future WWMMADF	8.6 21.5	8.7 21.8	8.7 21.9	9.2 21.3
RAS/WAS/SCUM PUMP STATION				
Length (feet)	60	65		
Width (feet)	40			
Height (feet)	15			
SCUM SUMP				
Length (feet)	5			
Width (feet)	5			
Height (feet)	5			
Major Mechanical Equipment				
SLUDGE/SCUM REMOVAL EQUIPMENT				
Type	Tow Bro			
Number of units	2	3		

Table C-5 Secondary Clarification Design Information				
	System Option			
Item	(1) No Discharge Winter Storage/ Summer Irrigation	(2) Rickreall discharge/ Summer irrigation	(3) Willamette discharge/ Demand irrigation	(4) Year-Round Rickreall Discharge
RAS PUMPS				
Type	Screw-induced centrifugal			
Number of units	3 (1 standby)	5 (2 standby)		
Flow capacity, each (mgd)	3.7	2.5		
Drive type	Adjustable speed			
Turndown	5:1	4:1		
TDH	15 feet			
Motor size, each (hp)	20	15		
WAS PUMPS				
Type	Screw-induced centrifugal			
Number of units	2 (one standby)			
Flow capacity, each (gpm)	250			
Drive type	Adjustable speed			
Turndown	5:1			
TDH	15			
Motor size, each (hp)	2			
SCUM PUMPS				
Type	Progressing cavity			
Number	2 (one standby)			
Flow, each (gpm)	250			
TDH (feet)	50			
Motor size, each (hp)	7.5			
Drive type	Constant speed			

Table C-6
Tertiary Clarification Design Information

Item	System Option (1) No Discharge Winter Storage/ Summer Irrigation	(2) Rickreall discharge/ Summer irrigation	(3) Willamette discharge/ Demand irrigation	(4) Year-Round Rickreall Discharge
Tertiary Clarification				
Physical/Structural Facilities (Tankage, Buildings, etc.)				
CLARIFIER TANKAGE				
Type	N/A			Solids contact
Number of units				2
Diameter (feet)				80
Total area, all units (ft^2)				10,053
Side water depth (feet)				20
SOR at future WWMMADF, all units in service (gpm/ft^2)				0.510
TERTIARY SLUDGE PUMP STATION				
Length (feet)	N/A			40
Width (feet)				15
Height (feet)				15
Major Mechanical Equipment				
SLUDGE REMOVAL EQUIPMENT				
Type	N/A			Suction withdrawal
Number of units				2
TERTIARY SLUDGE PUMPS				
Type	N/A			Screw induced centrifugal
Number of units (incl. 1 standby)				3
Flow capacity, each (gpm)				150
Drive type				Adjustable speed
Turndown				5:1
TDH (feet)				40
Motor size, each (hp)				3

Table C-6 Tertiary Clarification Design Information				
	System Option			
Item	(1) No Discharge Winter Storage/ Summer Irrigation	(2) Rickreall discharge/ Summer irrigation	(3) Willamette discharge/ Demand irrigation	(4) Year-Round Rickreall Discharge
LIQUID POLYMER METERING PUMPS				
Type	N/A			Mechanical metering
Number of units				4
Flow capacity, each (gph)				3-20
Drive type				Adjustable speed
TDH (feet)				50
Motor size, each (hp)				0.01
LIQUID POLYMER STORAGE TANKS				
Material	N/A			FRP
Number of tanks				1
Capacity, each (gallons)				6,500

Table C-7 Coagulation/Flocculation Design Information				
Item	**System Option**			
Item	**(1) No Discharge Winter Storage/ Summer Irrigation**	**(2) Rickreall discharge/ Summer irrigation**	**(3) Willamette discharge/ Demand irrigation**	**(4) Year-Round Rickreall Discharge**
Coagulation/Flocculation				
Physical/Structural Facilities (Tankage, Buildings, etc.)				
POLYMER METERING BUILDING				
Length (feet)	N/A	25		N/A
Width (feet)		15		
Height (feet)		15		
Major Mechanical Equipment				
LIQUID POLYMER METERING PUMPS				
Type	N/A	Mechanical metering		N/A
Number of units		4		
Flow capacity, each (gph)		3-20		
LIQUID POLYMER STORAGE TANKS				
Material	N/A	FRP		N/A
Number of tanks		1		
Capacity each, gallons		6,500		
COAGULATION MIXERS				
Type	N/A	In-line static		N/A
Number of units		2		
Diameter, each unit (inches)		12		

Table C-8
Filtration Design Information

Item	System Option (1) No Discharge Winter Storage/ Summer Irrigation	(2) Rickreall discharge/ Summer irrigation	(3) Willamette discharge/ Demand irrigation	(4) Year-Round Rickreall Discharge
Filtration				
Physical/Structural Facilities (Tankage, Buildings, etc.)				
FILTERS				
Type	N/A	Continuous backwash deep bed	Continuous backwash deep bed	Conventional deep bed
Number of units		6	6	4
Cells per unit		4	4	1
Cell Length (feet)		7.08	7.08	20
Cell Width (feet)		7.08	7.08	17
Total area (ft^2)		1,200	1,200	1,360
Depth Overall Media		25 ft 80 in	25 ft 80 in	15 ft 4 ft
Filtration rate at future WWMMADF (gpm/ft^2) (target is 4 for conventional, 4.5 for continuous backwash)		4.27	4.27	3.77
Sand particle size (mm)		1.2-1.5	1.2-1.5	1.2-1.5
Backwash type		Air scour and water	Air scour and water	Air scour and water
BACKWASH PUMP/AIR SCOUR BLOWER BUILDING				
Length (feet)	N/A	Part of package system	Part of package system	80
Width (feet)				40
Height (feet)				15
BACKWASH RESERVOIR				
Backwash rate, max. (gpm/ft^2)	N/A	Not required	Not required	20
Capacity required, 2 backwashes of 10 minutes each (MG)	N/A	Not required	Not required	0.14[a]
BACKWASH SURGE TANK				
Capacity (MG)	N/A	Not required	Not required	0.14
Length (feet)				75
Width (feet)				25

Table C-8 Filtration Design Information				
	System Option			
Item	(1) No Discharge Winter Storage/ Summer Irrigation	(2) Rickreall discharge/ Summer irrigation	(3) Willamette discharge/ Demand irrigation	(4) Year-Round Rickreall Discharge
Height (feet)				10
Major Mechanical Equipment				
BACKWASH PUMPS				
Type	N/A	Not required	Not required	Vertical turbine
Number of units				2
Flow capacity, each (mgd)				10
TDH (feet)				25
Motor size, each (hp)				75
Drive type				AS
Turndown				5:1
AIR SCOUR BLOWERS				
Type	N/A	Part of package system	Part of package system	Centrifugal
Number of units				2
Scour rate, max. (scfm/ft^2)				5
Capacity, each (scfm)				1,700
TDH (feet)				20
Motor size, each (hp)				125
Drive type				Constant speed

[a] The chlorine contact tanks are assumed to double as backwash reservoirs.

Table C-9
Microfiltration (MF) and Reverse Osmosis (RO) Design Information
(Applies to System Option 4—Year Round Rickreall Discharge Only)

Item	Description
Microfiltration	
Microfilter Feed Pumps	
Number	3 (2 online, 1 standby)
Capacity, each	1,850 gpm
TDH	120 ft
Motor size, each	100 hp
Pre-Disinfection Chemical Addition	
Sodium hypochlorite dose	4 mg/L as Cl_2
Aqueous ammonia dose	1.32 mg/L as NH_3
Microfiltration System	
Number of assemblies	5
Filtrate capacity	4.9 mgd
Modules per assembly	90
Surface area per module	15 m^2
Total membrane area	6,750 m^2
Membrane flux	0.29 gpm/m^2
Membrane type	Polypropylene hollow fiber
Nominal pore size	0.2 µm
Feedwater recovery rate	92%
Feed pressure	35 psi
Transmembrane pressure	3-15 psi
Backwash interval	20 minutes
Backwash Water Pumps	
Number	2
Capacity, each	1,200 gpm
TDH	35 ft
Motor size, each	20 hp
Filtrate Transfer Pumps	
Number	3 (2 online, 1 standby)
Capacity, each	1,700 gpm
TDH	95 ft
Motor size, each	60 hp
Reverse Osmosis	
Cartridge Filters	
No. of housings	2
Cartridge type	Polypropylene
Retention rating	5 micron (nominal)
Loading rate	5 gpm/10" equiv.
Chemical Conditioning Systems	
Sulfuric acid dose	200 mg/L

Table C-9
Microfiltration (MF) and Reverse Osmosis (RO) Design Information
(Applies to System Option 4—Year Round Rickreall Discharge Only)

Item	Description
Antiscalant dose	3 mg/L
High Pressure Pumps	
Number	3 (2 online, 1 standby)
Capacity, each	1,100 gpm
TDH	400 psi
Motor size, each	400 hp
Reverse Osmosis System	
Number of trains	3
Product water capacity per train	1.39 mgd
Number of hydraulic stages	3 (concentrate staged)
Feedwater recovery	85 %
Membrane type	Cellulose acetate
Membrane flux (average)	13 gpd/sq ft
TDS rejection	88.5%

Table C-10
Disinfection/Dechlorination Design Information

Item	System Option (1) No Discharge Winter Storage/ Summer Irrigation	(2) Rickreall discharge/ Summer irrigation	(3) Willamette discharge/ Demand irrigation	(4) Year-Round Rickreall Discharge
Disinfection/Dechlorination				
Physical/Structural Facilities (Tankage, Buildings, etc.)				
CHLORINE CONTACT TANKAGE				
Type	NaOCl, no dechlor.	NaOCl with dechlor.	NaOCl, no dechlor.	NaOCl with dechlor.
Number of contact tanks	2			
Passes per tank	3			
Length per pass	100 feet			
Width of pass	7.5 feet			
Side water depth	10 feet			
Total contact volume (MG)	0.34			
Detention time: future WWMMADF, all tanks in service (need 60 mins)	65 minutes			
CHLORINATION/DECHLORINATION BUILDING				
Length	30	30	50	50
Width	25	25	40	40
Height	20			
Major Mechanical Equipment				
BULK HYPOCHLORITE STORAGE				
Avg. chlorine dose (as Cl_2)	5 mg/L	5 mg/L	10 mg/L	10 mg/L
15-d use (12.5%): avg. dose, future WWMMADF (gals)	4,065	4,065	8,130	8,130
Number of storage tanks	1	1	1	1
Tank capacity, each (gals)	6,500	6,500	10,000	10,000
Tank material	Crosslinked HDPE			
HYPOCHLORITE METERING PUMPS				
Max. chlorine dose (as Cl_2)	10 mg/L	10 mg/L	25 mg/L	25 mg/L
Pump type	Plastic-lined piston diaphragm			
No. of pumps (incl. 1 standby)	4	4	4	4
Capacity, each (gph)	18	18	45	45
TDH (feet)	15	15	15	15
Horsepower, each	0.002	0.002	0.005	0.005
Drive type	Adjustable speed			

Table C-10
Disinfection/Dechlorination Design Information

Item	System Option (1) No Discharge Winter Storage/ Summer Irrigation	(2) Rickreall discharge/ Summer irrigation	(3) Willamette discharge/ Demand irrigation	(4) Year-Round Rickreall Discharge
HYPOCHLORITE MIXERS				
Type	In-line static			
Number of units	2			
Diameter, each unit (inches)	12			
SODIUM BISULFITE BULK STORAGE (DECHLORINATION)				
Assumed avg. Cl residual to be dechlorinated (mg Cl_2/L)	N/A	2	N/A	7
Stoichio. bisulfite dose (mg/L)		2.7		9
30-d use of 38 pct w/w solution: avg. dose, future WWMMADF lb gals		 15,397 1,358		 51,322 4,526
Number of storage tanks		1		1
Capacity of tank, each (gals)		6,500		6,500
Tank material		FRP		FRP
BISULFITE METERING PUMPS				
Assumed max. Cl residual to be dechlorinated (mg Cl_2/L)	N/A	7	N/A	10
Stoichio. bisulfite dose (mg/L)		9		13
Pump type		Diaphragm		Diaphragm
Number of units (incl. 1 standby)		4		4
Capacity, each (gph)		5		7.5
TDH (feet)		20		20
Horsepower, each		0.001		0.002
Drive type		Adj. speed		Adj. speed

Table C-11 Reaeration Design Information				
	System Option			
Item	**(1) No Discharge Winter Storage/ Summer Irrigation**	**(2) Rickreall discharge/ Summer irrigation**	**(3) Willamette discharge/ Demand irrigation**	**(4) Year-Round Rickreall Discharge**
Reaeration				
Physical/Structural Facilities (Tankage, Buildings, etc.)				
DECHLORINATION/REAERATION CHANNEL				
Length (feet)	N/A	75	N/A	75
Width (feet)		25		25
Depth (feet)		10		10
Major Mechanical Equipment				
AERATORS				
Type	N/A	Surface	N/A	Surface
Number (incl. 1 standby)		5		5
Horsepower, each		30		30
Assumed chlorinated effluent DO (mg/L)		0		0
Max. WW temperature (°C)		12		12
DO saturation conc. at above temperature and 1 atm. (mg/L)		10.9		10.9
Target final eff. DO, assumed 95 percent of saturation (mg/L)		10.4		10.4
Actual OTR reqd. at WWMMADF=8.2 mgd (lb/hr)		30		30
SOTR[a] (lb/hr)		371		371

[a] Assumed alpha=beta=0.95, and DO saturation conc. at 20°C and 1 atm barometric pressure=10.1 mg/L.

Table C-12 Intermediate Pumping Design Information				
	System Option			
Item	**(1) No Discharge Winter Storage/ Summer Irrigation**	**(2) Rickreall discharge/ Summer irrigation**	**(3) Willamette discharge/ Demand irrigation**	**(4) Year-Round Rickreall Discharge**
Intermediate Pumping				
Physical/Structural Facilities (Tankage, Buildings, etc.)				
INTERMEDIATE PUMP WET WELL				
Diameter (feet)	15	N/A		N/A
Depth (feet)	20	N/A		N/A
Major Mechanical Equipment				
INTERMEDIATE PUMPS				
Type	Vertical turbine		N/A	N/A
Total capacity (mgd)	18.3	N/A		N/A
TDH (feet)	20	N/A		N/A
Number of pumps 2.3 mgd/15 hp Constant speed Adjustable speed 8 mgd/50 hp Constant speed Adjustable speed	 None 1 2 1	N/A		N/A

Table C-13 Effluent Pumping Design Information				
	System Option			
Item	(1) No Discharge Winter Storage/ Summer Irrigation	(2) Rickreall discharge/ Summer irrigation	(3) Willamette discharge/ Demand irrigation	(4) Year-Round Rickreall Discharge
Effluent Pumping				
Physical/Structural Facilities (Tankage, Buildings, etc.)				
EFFLUENT PUMP WET WELL				
Length (feet)	N/A			N/A
Width (feet)	N/A			N/A
Diameter (feet)	15			N/A
Depth (feet)	20			N/A
EFFLUENT PUMP STATION				
Length (feet)	30			N/A
Width (feet)	20			N/A
Height (feet)	15			N/A
Major Mechanical Equipment				
EFFLUENT PUMPS				
Type	Vertical turbine			
Total capacity (mgd)	10	7	16.1	N/A
Irrigation head (psi)	120	120		
TDH (feet)			564	N/A
Constant speed 2.3 mgd pumps: no./hp ea.		2/150	1/350	N/A
3.4 mgd pumps: no./hp ea.	2/250			
5.8 mgd pumps: no./hp ea.			3/800	N/A
Adjustable speed 2.3 mgd pumps: no./hp ea.		2/150	2/350	N/A
3.4 mgd pumps: no./hp ea.	2/250			

Appendix D
Water Balance Analysis and Poplar Tree Characteristics

Table 1
Alternative 1–No Discharge, Winter Storage, Summer Poplar Tree Reuse
Year 3 Water Balance for Poplar Trees & Grass, Average Year

Parameter		January	February	March	April	May	June	July	August	September	October	November	December	Totals
Mean Precipitation	(inches)	6.50	5.20	4.60	2.30	2.10	1.50	0.40	0.50	1.40	4.00	5.80	7.10	41.40
	(MG)	158.88	127.10	112.44	56.22	51.33	36.66	9.78	12.22	34.22	97.77	141.77	173.54	1011.92
Surface Losses														
Canopy interception	(inches)	0.33	0.26	0.23	0.12	0.11	0.08	0.02	0.03	0.07	0.20	0.29	0.36	2.07
	(MG)	7.94	6.36	5.62	2.81	2.57	1.83	0.49	0.61	1.71	4.89	7.09	8.68	50.60
Grnd litter retention	(inches)	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.50
	(MG)	2.44	2.44	2.44	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.44	2.44	12.22
Surface Runoff	(inches)	0.59	0.47	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.52	0.64	2.99
	(MG)	14.30	11.44	10.12	0.00	0.00	0.00	0.00	0.00	0.00	8.80	12.76	15.62	73.03
Effective Rainfall	(inches)	5.49	4.37	3.86	2.19	2.00	1.43	0.38	0.48	1.33	3.44	4.89	6.01	35.84
	(MG)	134.19	106.86	94.25	53.41	48.76	34.83	9.29	11.61	32.51	84.08	119.47	146.80	876.07
Water Supply														
WWTP 2020 Flow	(inches)	7.33	7.35	6.38	4.69	3.73	3.11	2.75	2.80	2.41	2.73	4.18	6.43	53.90
	(MG)	179.18	179.51	155.93	114.60	91.14	75.90	67.27	68.51	58.80	66.65	102.00	157.17	1316.66
	(mgd)	5.78	6.19	5.03	3.82	2.94	2.53	2.17	2.21	1.96	2.15	3.40	5.07	3.61
Supplemental Irrigation	(inches)	0.00	0.00	0.00	0.00	2.27	4.89	8.25	8.20	6.59	0.27	0.00	0.00	30
(from Storage)	(MG)	0.00	0.00	0.00	0.00	55.47	119.60	201.56	200.32	161.15	6.64	0.00	0.00	744.75
	(mgd)	0.00	0.00	0.00	0.00	1.79	3.99	6.50	6.46	5.37	0.21	0.00	0.00	2.04
Total Water Supply	(inches)	7.33	7.35	6.38	4.69	6.00	8.00	11.00	11.00	9.00	3.00	4.18	6.43	84
	(MG)	179.27	179.60	156.01	114.66	146.66	195.54	268.87	268.87	219.98	73.33	102.05	157.25	2062.09
	(mgd)	5.78	6.19	5.03	3.82	4.73	6.52	8.67	8.67	7.33	2.37	3.40	5.07	5.65
Water Demand (year 3)														
Potential ET	(inches)	0.00	0.00	2.49	4.76	7.58	9.91	12.13	9.91	7.24	3.46	0.91	0.00	58.40
	(MG)	0.00	0.00	60.78	116.29	185.17	242.30	296.59	242.30	177.06	84.68	22.28	0.00	1427.44
	(mgd)	0.00	0.00	1.96	3.88	5.97	8.08	9.57	7.82	5.90	2.73	0.74	0.00	3.91
Net Irrigation	(inches)	0.00	0.00	0.13	2.78	6.34	9.38	12.72	10.57	7.16	2.85	0.00	0.00	51.93
Recommended	(MG)	0.00	0.00	3.18	67.95	154.97	229.27	310.91	258.36	175.01	69.66	0.00	0.00	1269.30
Irrigation Applied	(inches)	0.00	0.00	0.00	3.00	6.00	8.00	11.00	11.00	9.00	3.00	3.00	0.00	54.00
	(MG)	0.00	0.00	0.00	73.33	146.66	195.54	268.87	268.87	219.98	73.33	73.33	0.00	1319.90
	(mgd)	0.00	0.00	0.00	2.44	4.73	6.52	8.67	8.67	7.33	2.37	2.44	0.00	3.62
Total Available Water to Infiltrate														
	(inches)	5.49	4.37	3.86	5.19	8.00	9.43	11.38	11.48	10.33	6.44	7.89	6.01	89.84
	(MG)	134.19	106.86	94.25	126.73	195.42	230.37	278.16	280.48	252.49	157.41	192.80	146.80	2195.96
	(mgd)	4.33	3.68	3.04	4.22	6.30	7.68	8.97	9.05	8.42	5.08	6.43	4.74	6.02
Storage Analysis														
Discharge to	(inches)	7.33	7.35	6.38	1.69	0.00	0.00	0.00	0.00	0.00	0.00	1.18	6.43	-2.07
Storage Facility	(MG)	179.27	179.60	156.01	41.33	0.00	0.00	0.00	0.00	0.00	0.00	28.72	157.25	742.19
	(mgd)	5.78	6.19	5.03	1.38	0.00	0.00	0.00	0.00	0.00	0.00	0.96	5.07	2.03
	Storage In/Out (MG)	179.18	179.51	155.93	41.27	-55.52	-119.64	-201.60	-200.36	-161.18	-6.68	28.67	157.17	
	Storage Accum (MG)	365.02	544.53	700.46	741.74	686.22	566.58	364.98	164.63	3.44	0.00	28.67	185.84	
Soil Profile Balance														
	Field Capacity (inches)	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	
	Beginning Soil Moisture (inches)	25.50	25.50	25.50	25.50	25.33	24.55	22.46	19.50	18.87	20.15	22.53	25.50	
	Ending Soil Moisture (inches)	30.99	29.87	26.87	25.33	24.55	22.46	19.50	18.87	20.15	22.53	28.90	31.51	
	Wilting Point (inches)	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	
	Deep Percolation (inches)	5.49	4.37	1.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.40	6.01	20.64
	Deep Percolation (MG)	134.19	106.86	33.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	83.21	146.80	504.54

Notes:

1 Irrigated Land= 900 acres

2 Percolation below root zone-- water infiltrating beyond the root zone, occurs when field capacity is exceeded

3 Irrigation efficiency = 0.8

4 Gross Irrigation Requirement = net irrigation/irrigation efficiency, net irrigation = consumptive use -effective precipitation

5 At wilting point, no water can be removed from the soil profile, therefore the crop reduces consumptive use demand (projected ET (CU)).

FC= 25.5 PWP= 12.75 Pct Runoff 9 RO begin 3.5 Addl. Dep. 1

Table 2
Alternative 2– Rickreall Discharge & Summer Poplar Tree Reuse July through October
Year 3 Water Balance for Poplar Trees & Grass, Average Year

Parameter		January	February	March	April	May	June	July	August	September	October	November	December	Totals
Mean Precipitation	(inches)	6.50	5.20	4.60	2.30	2.10	1.50	0.40	0.50	1.40	4.00	5.80	7.10	41.40
	(MG)	44.13	35.31	31.23	15.62	14.26	10.18	2.72	3.39	9.51	27.16	39.38	48.21	281.09
Surface Losses														
Canopy interception	(inches)	0.33	0.26	0.23	0.12	0.11	0.08	0.02	0.03	0.07	0.20	0.29	0.36	2.07
	(MG)	2.21	1.77	1.56	0.78	0.71	0.51	0.14	0.17	0.48	1.36	1.97	2.41	14.05
Grnd litter retention	(inches)	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.50
	(MG)	0.68	0.68	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.68	0.68	3.39
Surface Runoff	(inches)	0.59	0.47	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.52	0.64	2.99
	(MG)	3.97	3.18	2.81	0.00	0.00	0.00	0.00	0.00	0.00	2.44	3.54	4.34	20.29
Effective Rainfall	(inches)	5.49	4.37	3.86	2.19	2.00	1.43	0.38	0.48	1.33	3.44	4.89	6.01	35.84
	(MG)	37.27	29.68	26.18	14.84	13.55	9.68	2.58	3.23	9.03	23.36	33.19	40.78	243.35
Water Supply														
WWTP 2020 Flow	(inches)	26.40	26.45	22.98	16.89	13.43	11.18	9.91	10.10	8.66	9.82	15.03	23.16	194.02
	(MG)	179.18	179.51	155.93	114.60	91.14 -	75.90	67.27	68.51	58.80	66.65	102.00	157.17	1316.66
	(mgd)	5.78	6.19	5.03	3.82	2.94	2.53	2.17	2.21	1.96	2.15	3.40	5.07	3.61
Supplemental Irrigation	(inches)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
	(MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(mgd)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Water Supply	(inches)	26.40	26.45	22.98	16.89	13.43	11.18	9.91	10.10	8.66	9.82	15.03	23.16	194
	(MG)	179.27	179.60	156.01	114.66	91.19	75.94	67.30	68.55	58.83	66.68	102.05	157.25	1317.34
	(mgd)	5.78	6.19	5.03	3.82	2.94	2.53	2.17	2.21	1.96	2.15	3.40	5.07	3.61
Water Demand (year 3)														
Potential ET	(inches)	0.00	0.00	2.49	4.76	7.58	9.91	12.13	9.91	7.24	3.46	0.91	0.00	58.40
	(MG)	0.00	0.00	16.88	32.30	51.44	67.30	82.39	67.30	49.18	23.52	6.19	0.00	396.51
	(mgd)	0.00	0.00	0.54	1.08	1.66	2.24	2.66	2.17	1.64	0.76	0.21	0.00	1.09
Projected ET (CU)	(inches)	0.00	0.00	2.49	4.76	7.58	9.91	12.13	9.91	7.24	3.46	0.91	0.00	58.40
	(MG)	0.00	0.00	16.88	32.30	51.44	67.30	82.39	67.30	49.18	23.52	6.19	0.00	396.51
Irrigation Applied	(inches)	0.00	0.00	0.00	2.86	6.20	9.43	9.91	10.10	8.66	9.82	0.00	0.00	56.98
	(MG)	0.00	0.00	0.00	19.41	42.10	64.03	67.30	68.55	58.83	66.68	0.00	0.00	386.90
	(mgd)	0.00	0.00	0.00	0.65	1.36	2.13	2.17	2.21	1.96	2.15	0.00	0.00	1.06
Total Available Water to Infiltrate														
	(inches)	5.49	4.37	3.86	5.04	8.20	10.86	10.29	10.57	9.99	13.26	4.89	6.01	92.83
	(MG)	37.27	29.68	26.18	34.24	55.65	73.71	69.88	71.77	67.86	90.04	33.19	40.78	630.26
	(mgd)	1.20	1.02	0.84	1.14	1.80	2.46	2.25	2.32	2.26	2.90	1.11	1.32	1.73
Storage Analysis														
Discharge to	(inches)	26.40	26.45	22.98	14.03	7.23	1.75	0.00	0.00	0.00	0.00	15.03	23.16	1.42
Rickreall Creek	(MG)	179.27	179.60	156.01	95.25	49.09	11.91	0.00	0.00	0.00	0.00	102.05	157.25	930.43
	(mgd)	5.78	6.19	5.03	3.18	1.58	0.40	0.00	0.00	0.00	0.00	3.40	5.07	2.55
	Storage In/Out (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Storage Accum (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Soil Profile Balance														
	Field Capacity (inches)	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	
	Beginning Soil Moisture (inches)	25.50	25.50	25.50	25.50	25.50	25.50	25.50	22.67	22.32	12.75	21.56	25.50	
	Ending Soil Moisture (inches)	30.99	29.87	26.87	25.50	25.50	25.50	22.67	22.32	24.20	21.56	25.54	31.51	
	Wilting Point (inches)	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	
	Deep Percolation (inches)	5.49	4.37	1.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	6.01	17.28
	Deep Percolation (MG)	37.27	29.68	9.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	40.78	117.31

Notes:

1 Irrigated Land= 250 acres

2 Percolation below root zone-- water infiltrating beyond the root zone, occurs when field capacity is exceeded

3 Irrigation efficiency = 0.9

4 Gross Irrigation Requirement = net irrigation/irrigation efficiency, net irrigation = consumptive use -effective precipitation

5 At wilting point, no water can be removed from the soil profile, therefore the crop reduces consumptive use demand (projected ET (CU)).

FC= 25.5 PWP= 12.75 Pct Runoff 9 RO begin 3.5 Addl. Dep. 1

Table 3
Option 2A
Advanced Biological w/o Filtration ; Poplar Tree Reuse During May through November
Year 3 Water Balance for Poplar Trees & Grass, Average Year

Parameter		January	February	March	April	May	June	July	August	September	October	November	December	Totals
Mean Precipitation	(inches)	6.50	5.20	4.60	2.30	2.10	1.50	0.40	0.50	1.40	4.00	5.80	7.10	41.40
	(MG)	112.27	89.82	79.45	39.73	36.27	25.91	6.91	8.64	24.18	69.09	100.18	122.64	715.09
Surface Losses														
Canopy interception	(inches)	0.33	0.26	0.23	0.12	0.11	0.08	0.02	0.03	0.07	0.20	0.29	0.36	2.07
	(MG)	5.61	4.49	3.97	1.99	1.81	1.30	0.35	0.43	1.21	3.45	5.01	6.13	35.75
Grnd litter retention	(inches)	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.50
	(MG)	1.73	1.73	1.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.73	1.73	8.64
Surface Runoff	(inches)	0.59	0.47	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.52	0.64	2.99
	(MG)	10.10	8.08	7.15	0.00	0.00	0.00	0.00	0.00	0.00	6.22	9.02	11.04	51.61
Effective Rainfall	(inches)	5.49	4.37	3.86	2.19	2.00	1.43	0.38	0.48	1.33	3.44	4.89	6.01	35.84
	(MG)	94.83	75.52	66.60	37.74	34.46	24.61	6.56	8.20	22.97	59.42	84.43	103.74	619.09
Water Supply														
WWTP 2020 Flow	(inches)	10.38	10.40	9.03	6.64	5.28	4.40	3.90	3.97	3.41	3.86	5.91	9.10	76.27
	(MG)	179.18	179.51	155.93	114.60	91.14	75.90	67.27	68.51	58.80	66.65	102.00	157.17	1316.66
	(mgd)	5.78	6.19	5.03	3.82	2.94	2.53	2.17	2.21	1.96	2.15	3.40	5.07	3.61
Supplemental Irrigation	(inches)	0.00	0.00	0.00	0.00	0.00	0.00	0.95	6.52	3.17	0.00	0.00	0.00	11
	(MG)	0.00	0.00	0.00	0.00	0.00	0.00	16.46	112.59	54.67	0.00	0.00	0.00	183.72
	(mgd)	0.00	0.00	0.00	0.00	0.00	0.00	0.53	3.63	1.82	0.00	0.00	0.00	0.50
Total Water Supply	(inches)	10.38	10.40	9.03	6.64	5.28	4.40	4.85	10.49	6.57	3.86	5.91	9.10	87
	(MG)	179.27	179.60	156.01	114.66	91.19	75.94	83.76	181.13	113.50	66.68	102.05	157.25	1501.05
	(mgd)	5.78	6.19	5.03	3.82	2.94	2.53	2.70	5.84	3.78	2.15	3.40	5.07	4.11
Water Demand (year 3)														
Potential ET	(inches)	0.00	0.00	2.49	4.76	7.58	9.91	12.13	9.91	7.24	3.46	0.91	0.00	58.40
	(MG)	0.00	0.00	42.95	82.18	130.85	171.22	209.59	171.22	125.12	59.84	15.75	0.00	1008.73
	(mgd)	0.00	0.00	1.39	2.74	4.22	5.71	6.76	5.52	4.17	1.93	0.52	0.00	2.76
Projected ET (CU)	(inches)	0.00	0.00	2.49	4.76	7.58	9.91	12.13	9.91	7.24	3.46	0.91	0.00	58.40
	(MG)	0.00	0.00	42.95	82.18	130.85	171.22	209.59	171.22	125.12	59.84	15.75	0.00	1008.73
Irrigation Applied	(inches)	0.00	0.00	0.00	2.86	5.28	4.40	4.85	10.49	6.57	3.86	5.91	0.00	44.21
	(MG)	0.00	0.00	0.00	49.37	91.19	75.94	83.76	181.13	113.50	66.68	102.05	0.00	763.63
	(mgd)	0.00	0.00	0.00	1.65	2.94	2.53	2.70	5.84	3.78	2.15	3.40	0.00	2.09
Total Available Water to Infiltrate														
	(inches)	5.49	4.37	3.86	5.04	7.27	5.82	5.23	10.96	7.90	7.30	10.80	6.01	80.05
	(MG)	94.83	75.52	66.60	87.11	125.65	100.55	90.33	189.34	136.47	126.10	186.48	103.74	1382.72
	(mgd)	3.06	2.60	2.15	2.90	4.05	3.35	2.91	6.11	4.55	4.07	6.22	3.35	3.79
Storage Analysis														
Discharge to	(inches)	10.38	10.40	9.03	3.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.10	14.19
Rickreall Creek	(MG)	179.27	179.60	156.01	65.29	0.00	0.00	0.00	0.00	0.00	0.00	0.00	157.25	737.42
	(mgd)	5.78	6.19	5.03	2.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.07	2.02
	Storage In/Out (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Storage Accum (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Soil Profile Balance														
	Field Capacity (inches)	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	
	Beginning Soil Moisture (inches)	25.50	25.50	25.50	25.50	25.50	24.67	20.14	12.75	12.75	12.75	16.20	25.49	
	Ending Soil Moisture (inches)	30.99	29.87	26.87	25.50	24.67	20.14	12.75	12.75	12.75	16.20	25.49	31.50	
	Wilting Point (inches)	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	
	Deep Percolation (inches)	5.49	4.37	1.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	17.23
	Deep Percolation (MG)	94.83	75.52	23.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	103.63	297.63

Notes:

1 Irrigated Land= 636 acres

2 Percolation below root zone-- water infiltrating beyond the root zone, occurs when field capacity is exceeded

3 Irrigation efficiency = 0.9

4 Gross Irrigation Requirement = net irrigation/irrigation efficiency, net irrigation = consumptive use -effective precipitation

5 At wilting point, no water can be removed from the soil profile, therefore the crop reduces consumptive use demand (projected ET (CU)).

FC= 25.5 PWP= 12.75 Pct Runoff 9 RO begin 3.5 Addl. Dep. 1

Table 4
Option 2B
Advanced Biological with Filtration; Poplar Tree Reuse During July, August, September, and October
Year 3 Water Balance for Poplar Trees & Grass, Average Year

Parameter		January	February	March	April	May	June	July	August	September	October	November	December	Totals
Mean Precipitation	(inches)	6.50	5.20	4.60	2.30	2.10	1.50	0.40	0.50	1.40	4.00	5.80	7.10	41.40
	(MG)	44.13	35.31	31.23	15.62	14.26	10.18	2.72	3.39	9.51	27.16	39.38	48.21	281.09
Surface Losses														
Canopy interception	(inches)	0.33	0.26	0.23	0.12	0.11	0.08	0.02	0.03	0.07	0.20	0.29	0.36	2.07
	(MG)	2.21	1.77	1.56	0.78	0.71	0.51	0.14	0.17	0.48	1.36	1.97	2.41	14.05
Grnd litter retention	(inches)	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.50
	(MG)	0.68	0.68	0.68	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.68	0.68	3.39
Surface Runoff	(inches)	0.59	0.47	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.52	0.64	2.99
	(MG)	3.97	3.18	2.81	0.00	0.00	0.00	0.00	0.00	0.00	2.44	3.54	4.34	20.29
Effective Rainfall	(inches)	5.49	4.37	3.86	2.19	2.00	1.43	0.38	0.48	1.33	3.44	4.89	6.01	35.84
	(MG)	37.27	29.68	26.18	14.84	13.55	9.68	2.58	3.23	9.03	23.36	33.19	40.78	243.35
Water Supply														
WWTP 2020 Flow	(inches)	26.40	26.45	22.98	16.89	13.43	11.18	9.91	10.10	8.66	9.82	15.03	23.16	194.02
	(MG)	179.18	179.51	155.93	114.60	91.14	75.90	67.27	68.51	58.80	66.65	102.00	157.17	1316.66
	(mgd)	5.78	6.19	5.03	3.82	2.94	2.53	2.17	2.21	1.96	2.15	3.40	5.07	3.61
Supplemental Irrigation	(inches)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
	(MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(mgd)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Water Supply	(inches)	26.40	26.45	22.98	16.89	13.43	11.18	9.91	10.10	8.66	9.82	15.03	23.16	194
	(MG)	179.27	179.60	156.01	114.66	91.19	75.94	67.30	68.55	58.83	66.68	102.05	157.25	1317.34
	(mgd)	5.78	6.19	5.03	3.82	2.94	2.53	2.17	2.21	1.96	2.15	3.40	5.07	3.61
Water Demand (year 3)														
Potential ET	(inches)	0.00	0.00	2.49	4.76	7.58	9.91	12.13	9.91	7.24	3.46	0.91	0.00	58.40
	(MG)	0.00	0.00	16.88	32.30	51.44	67.30	82.39	67.30	49.18	23.52	6.19	0.00	396.51
	(mgd)	0.00	0.00	0.54	1.08	1.66	2.24	2.66	2.17	1.64	0.76	0.21	0.00	1.09
Projected ET (CU)	(inches)	0.00	0.00	2.49	4.76	7.58	9.91	12.13	9.91	7.24	3.46	0.91	0.00	58.40
	(MG)	0.00	0.00	16.88	32.30	51.44	67.30	82.39	67.30	49.18	23.52	6.19	0.00	396.51
Irrigation Applied	(inches)	0.00	0.00	0.00	2.86	6.20	9.43	9.91	10.10	8.66	9.82	0.00	0.00	56.98
	(MG)	0.00	0.00	0.00	19.41	42.10	64.03	67.30	68.55	58.83	66.68	0.00	0.00	386.90
	(mgd)	0.00	0.00	0.00	0.65	1.36	2.13	2.17	2.21	1.96	2.15	0.00	0.00	1.06
Total Available Water to Infiltrate														
	(inches)	5.49	4.37	3.86	5.04	8.20	10.86	10.29	10.57	9.99	13.26	4.89	6.01	92.83
	(MG)	37.27	29.68	26.18	34.24	55.65	73.71	69.88	71.77	67.86	90.04	33.19	40.78	630.26
	(mgd)	1.20	1.02	0.84	1.14	1.80	2.46	2.25	2.32	2.26	2.90	1.11	1.32	1.73
Storage Analysis														
Discharge to	(inches)	26.40	26.45	22.98	14.03	7.23	1.75	0.00	0.00	0.00	0.00	15.03	23.16	1.42
Rickreall Creek	(MG)	179.27	179.60	156.01	95.25	49.09	11.91	0.00	0.00	0.00	0.00	102.05	157.25	930.43
	(mgd)	5.78	6.19	5.03	3.18	1.58	0.40	0.00	0.00	0.00	0.00	3.40	5.07	2.55
	Storage In/Out (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Storage Accum (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Soil Profile Balance														
	Field Capacity (inches)	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	
	Beginning Soil Moisture (inches)	25.50	25.50	25.50	25.50	25.50	25.50	25.50	22.67	22.32	12.75	21.56	25.50	
	Ending Soil Moisture (inches)	30.99	29.87	26.87	25.50	25.50	25.50	22.67	22.32	24.20	21.56	25.54	31.51	
	Wilting Point (inches)	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	
	Deep Percolation (inches)	5.49	4.37	1.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	6.01	17.28
	Deep Percolation (MG)	37.27	29.68	9.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	40.78	117.31

Notes:

1 Irrigated Land= 250 acres
2 Percolation below root zone-- water infiltrating beyond the root zone, occurs when field capacity is exceeded
3 Irrigation efficiency = 0.9
4 Gross Irrigation Requirement = net irrigation/irrigation efficiency, net irrigation = consumptive use -effective precipitation
5 At wilting point, no water can be removed from the soil profile, therefore the crop reduces consumptive use demand (projected ET (CU)).

FC= 25.5 PWP= 12.75 Pct Runoff 9 RO begin 3.5 Addl. Dep. 1

Table 5
Poplar Tree Reuse of Industrial Effluent
Year 3 Water Balance for Poplar Trees & Grass, Average Year

Parameter		January	February	March	April	May	June	July	August	September	October	November	December	Totals
Mean Precipitation	(inches)	6.50	5.20	4.60	2.30	2.10	1.50	0.40	0.50	1.40	4.00	5.80	7.10	41.40
	(MG)	12.36	9.89	8.74	4.37	3.99	2.85	0.76	0.95	2.66	7.60	11.03	13.50	78.70
Surface Losses														
Canopy interception	(inches)	0.33	0.26	0.23	0.12	0.11	0.08	0.02	0.03	0.07	0.20	0.29	0.36	2.07
	(MG)	0.62	0.49	0.44	0.22	0.20	0.14	0.04	0.05	0.13	0.38	0.55	0.67	3.94
Grnd litter retention	(inches)	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.50
	(MG)	0.19	0.19	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.19	0.95
Surface Runoff	(inches)	0.59	0.47	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.52	0.64	2.99
	(MG)	1.11	0.89	0.79	0.00	0.00	0.00	0.00	0.00	0.00	0.68	0.99	1.21	5.68
Effective Rainfall	(inches)	5.49	4.37	3.86	2.19	2.00	1.43	0.38	0.48	1.33	3.44	4.89	6.01	35.84
	(MG)	10.44	8.31	7.33	4.15	3.79	2.71	0.72	0.90	2.53	6.54	9.29	11.42	68.14
Water Supply														
Industrial Flow	(inches)	3.26	3.05	3.26	3.16	3.26	3.16	3.26	3.26	3.16	3.26	3.16	3.26	38.52
	(MG)	6.20	5.80	6.20	6.00	6.20	6.00	6.20	6.20	6.00	6.20	6.00	6.20	73.20
	(mgd)	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20	0.20
Supplemental Irrigation	(inches)	0.00	0.00	0.00	0.00	0.00	0.00	4.84	7.22	3.41	0.00	0.00	0.00	15
	(MG)	0.00	0.00	0.00	0.00	0.00	0.00	9.20	13.73	6.49	0.00	0.00	0.00	29.43
	(mgd)	0.00	0.00	0.00	0.00	0.00	0.00	0.30	0.44	0.22	0.00	0.00	0.00	0.08
Total Water Supply	(inches)	3.26	3.05	3.26	3.16	3.26	3.16	8.10	10.49	6.57	3.26	3.16	3.26	54
	(MG)	6.20	5.80	6.20	6.00	6.20	6.00	15.41	19.94	12.49	6.20	6.00	6.20	102.66
	(mgd)	0.20	0.20	0.20	0.20	0.20	0.20	0.50	0.64	0.42	0.20	0.20	0.20	0.28
Water Demand (year 3)														
Potential ET	(inches)	0.00	0.00	2.49	4.76	7.58	9.91	12.13	9.91	7.24	3.46	0.91	0.00	58.40
	(MG)	0.00	0.00	4.73	9.04	14.40	18.85	23.07	18.85	13.77	6.59	1.73	0.00	111.02
	(mgd)	0.00	0.00	0.15	0.30	0.46	0.63	0.74	0.61	0.46	0.21	0.06	0.00	0.30
Projected ET (CU)	(inches)	0.00	0.00	2.49	4.76	7.58	9.91	12.13	9.91	7.24	3.46	0.91	0.00	58.40
	(MG)	0.00	0.00	4.73	9.04	14.40	18.85	23.07	18.85	13.77	6.59	1.73	0.00	111.02
Irrigation Applied	(inches)	0.00	0.00	0.00	2.86	3.26	3.16	8.10	10.49	6.57	3.26	3.16	0.00	40.86
	(MG)	0.00	0.00	0.00	5.43	6.20	6.00	15.41	19.94	12.49	6.20	6.00	0.00	77.68
	(mgd)	0.00	0.00	0.00	0.18	0.20	0.20	0.50	0.64	0.42	0.20	0.20	0.00	0.21
Total Available Water to Infiltrate														
	(inches)	5.49	4.37	3.86	5.04	5.26	4.58	8.48	10.96	7.90	6.70	8.05	6.01	76.70
	(MG)	10.44	8.31	7.33	9.59	10.00	8.71	16.13	20.84	15.02	12.74	15.30	11.42	145.82
	(mgd)	0.34	0.29	0.24	0.32	0.32	0.29	0.52	0.67	0.50	0.41	0.51	0.37	0.40
Storage Analysis														
Discharge to	(inches)	3.26	3.05	3.26	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.26	17.54
storage	(MG)	6.20	5.80	6.20	0.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.20	24.98
	(mgd)	0.20	0.20	0.20	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.20	0.07
	Storage In/Out (MG)	6.20	5.80	6.20	0.57	0.00	0.00	-9.20	-13.73	-6.49	0.00	0.00	6.20	
	Storage Accum (MG)	12.41	18.21	24.41	24.98	24.98	24.98	15.78	2.04	-4.44	-4.44	0.00	6.20	
Soil Profile Balance														
	Field Capacity (inches)	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	
	Beginning Soil Moisture (inches)	25.50	25.50	25.50	25.50	25.50	22.86	17.21	12.75	12.75	12.75	15.66	22.48	
	Ending Soil Moisture (inches)	30.99	29.87	26.87	25.50	22.86	17.21	12.75	12.75	12.75	15.66	22.48	28.49	
	Wilting Point (inches)	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	
	Deep Percolation (inches)	5.49	4.37	1.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	2.99	14.22
	Deep Percolation (MG)	10.44	8.31	2.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	5.68	27.03

Notes:

1 Irrigated Land= 70 acres

2 Percolation below root zone-- water infiltrating beyond the root zone, occurs when field capacity is exceeded

3 Irrigation efficiency = 0.9

4 Gross Irrigation Requirement = net irrigation/irrigation efficiency, net irrigation = consumptive use -effective precipitation

5 At wilting point, no water can be removed from the soil profile, therefore the crop reduces consumptive use demand (projected ET (CU)).

FC= 25.5 PWP= 12.75 Pct Runoff 9 RO begin 3.5 Addl. Dep. 1

Table 6
Option 2D
Conventional Biological with Wetlands; Poplar Tree Reuse During June, July, August, September, and October
Year 3 Water Balance for Poplar Trees & Grass, Average Year

Parameter		January	February	March	April	May	June	July	August	September	October	November	December	Totals
Mean Precipitation	(inches)	6.50	5.20	4.60	2.30	2.10	1.50	0.40	0.50	1.40	4.00	5.80	7.10	41.40
	(MG)	61.79	49.43	43.72	21.86	19.96	14.26	3.80	4.75	13.31	38.02	55.13	67.49	393.52
Surface Losses														
Canopy interception	(inches)	0.33	0.26	0.23	0.12	0.11	0.08	0.02	0.03	0.07	0.20	0.29	0.36	2.07
	(MG)	3.09	2.47	2.19	1.09	1.00	0.71	0.19	0.24	0.67	1.90	2.76	3.37	19.68
Grnd litter retention	(inches)	0.10	0.10	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.10	0.50
	(MG)	0.95	0.95	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.95	0.95	4.75
Surface Runoff	(inches)	0.59	0.47	0.41	0.00	0.00	0.00	0.00	0.00	0.00	0.36	0.52	0.64	2.99
	(MG)	5.56	4.45	3.94	0.00	0.00	0.00	0.00	0.00	0.00	3.42	4.96	6.07	28.40
Effective Rainfall	(inches)	5.49	4.37	3.86	2.19	2.00	1.43	0.38	0.48	1.33	3.44	4.89	6.01	35.84
	(MG)	52.18	41.56	36.65	20.77	18.96	13.55	3.61	4.52	12.64	32.70	46.46	57.09	340.69
Water Supply														
WWTP 2020 Flow	(inches)	18.86	18.89	16.41	12.06	9.59	7.99	7.08	7.21	6.19	7.02	10.74	16.54	138.59
	(MG)	179.18	179.51	155.93	114.60	91.14	75.90	67.27	68.51	58.80	66.65	102.00	157.17	1316.66
	(mgd)	5.78	6.19	5.03	3.82	2.94	2.53	2.17	2.21	1.96	2.15	3.40	5.07	3.61
Supplemental Irrigation	(inches)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0
	(MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	(mgd)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Water Supply	(inches)	18.86	18.89	16.41	12.06	9.59	7.99	7.08	7.21	6.19	7.02	10.74	16.54	139
	(MG)	179.27	179.60	156.01	114.66	91.19	75.94	67.30	68.55	58.83	66.68	102.05	157.25	1317.34
	(mgd)	5.78	6.19	5.03	3.82	2.94	2.53	2.17	2.21	1.96	2.15	3.40	5.07	3.61
Water Demand (year 3)														
Potential ET	(inches)	0.00	0.00	2.49	4.76	7.58	9.91	12.13	9.91	7.24	3.46	0.91	0.00	58.40
	(MG)	0.00	0.00	23.64	45.22	72.01	94.23	115.34	94.23	68.86	32.93	8.67	0.00	555.12
	(mgd)	0.00	0.00	0.76	1.51	2.32	3.14	3.72	3.04	2.30	1.06	0.29	0.00	1.52
Projected ET (CU)	(inches)	0.00	0.00	2.49	4.76	7.58	9.91	12.13	9.91	7.24	3.46	0.91	0.00	58.40
	(MG)	0.00	0.00	23.64	45.22	72.01	94.23	115.34	94.23	68.86	32.93	8.67	0.00	555.12
Irrigation Applied	(inches)	0.00	0.00	0.00	2.86	6.20	7.99	7.08	7.21	6.19	7.02	2.76	0.00	47.30
	(MG)	0.00	0.00	0.00	27.17	58.94	75.94	67.30	68.55	58.83	66.68	26.24	0.00	449.65
	(mgd)	0.00	0.00	0.00	0.91	1.90	2.53	2.17	2.21	1.96	2.15	0.87	0.00	1.23
Total Available Water to Infiltrate														
	(inches)	5.49	4.37	3.86	5.04	8.20	9.41	7.46	7.69	7.52	10.46	7.65	6.01	83.15
	(MG)	52.18	41.56	36.65	47.94	77.90	89.48	70.92	73.06	71.47	99.38	72.70	57.09	790.35
	(mgd)	1.68	1.43	1.18	1.60	2.51	2.98	2.29	2.36	2.38	3.21	2.42	1.84	2.17
Storage Analysis														
Discharge to	(inches)	18.86	18.89	16.41	9.20	3.39	0.00	0.00	0.00	0.00	0.00	7.98	16.54	11.10
Rickreall Creek	(MG)	179.27	179.60	156.01	87.49	32.25	0.00	0.00	0.00	0.00	0.00	75.81	157.25	867.68
	(mgd)	5.78	6.19	5.03	2.92	1.04	0.00	0.00	0.00	0.00	0.00	2.53	5.07	2.38
	Storage In/Out (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Storage Accum (MG)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Soil Profile Balance														
	Field Capacity (inches)	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	25.50	
	Beginning Soil Moisture (inches)	25.50	25.50	25.50	25.50	25.50	25.50	24.20	18.82	15.87	12.75	19.04	25.50	
	Ending Soil Moisture (inches)	30.99	29.87	26.87	25.50	25.50	24.20	18.82	15.87	15.53	19.04	25.50	31.51	
	Wilting Point (inches)	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	12.75	
	Deep Percolation (inches)	5.49	4.37	1.37	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.01	17.24
	Deep Percolation (MG)	52.18	41.56	13.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	57.09	163.85

Notes:

1 Irrigated Land= 350 acres

2 Percolation below root zone-- water infiltrating beyond the root zone, occurs when field capacity is exceeded

3 Irrigation efficiency = 0.9

4 Gross Irrigation Requirement = net irrigation/irrigation efficiency, net irrigation = consumptive use -effective precipitation

5 At wilting point, no water can be removed from the soil profile, therefore the crop reduces consumptive use demand (projected ET (CU)).

FC= 25.5 PWP= 12.75 Pct Runoff 9 RO begin 3.5 Addl. Dep. 1

Poplar Tree Characteristics

General Description

Populus spp. (poplar) trees are among the fastest growing plants in Oregon's climate. They have the physiological capacity to capture more sunlight and utilize more nutrients during a growing season than other annual crops grown near Dallas, and therefore can produce more organic biomass per planted area.

Because plants utilize a relatively uniform amount of water and other nutrients for every pound of biomass grown, faster growth translates into uptake of more water, nitrogen, phosphorus, and other essential elements. Root uptake is the primary mechanism for removing the water and nutrients from the soil. Poplar trees exhibit a vigorous growth rate as illustrated in Figure 1. The biomass growth in the leaves, stem and roots sequesters the nutrients. The leaves fall and can be collected, the stem can be harvested, and the roots may decompose in place. Decomposing plant material in the soil contributes to humus formation and improved soil tilth.

Hybrid poplar trees offer a number of features that make them well-suited for industrial or municipal wastewater reuse:

- If the plant system is maintained at a maximum growth rate, it cycles more water and nutrient elements through the trees for a given land area than is possible with other crops.
- With varietal selection, the system can develop a long growing season and broad climatic tolerance.
- Varietal selection can provide the greatest tolerance for wastewater constituents and site soils.
- Roots can be induced to grow deeper than 5 feet in the soil, which permits a large amount of winter water storage and subsequent retrieval during the growing season.
- Rapid growth brings the site to full function in two to three growing seasons.
- Poplar wood can be marketed for wood chips for paper and pulp and other uses.
- Once established, the trees require low maintenance, yet reliably pumps water

Within the past decade, more than 10,000 acres of hybrid poplar trees have been put into production in the Willamette Valley. This rapid expansion has primarily been due to the steadily increasing demand for high-quality hardwood chips for paper pulp and other chip markets. The successful development of improved species of hybrid poplar trees has greatly boosted crop acceptance.

- Hybrid poplars have a very long growing season. Leaves appear and begin transpiring water from the soil by mid-March. In the Willamette Valley, leaf drop can vary from

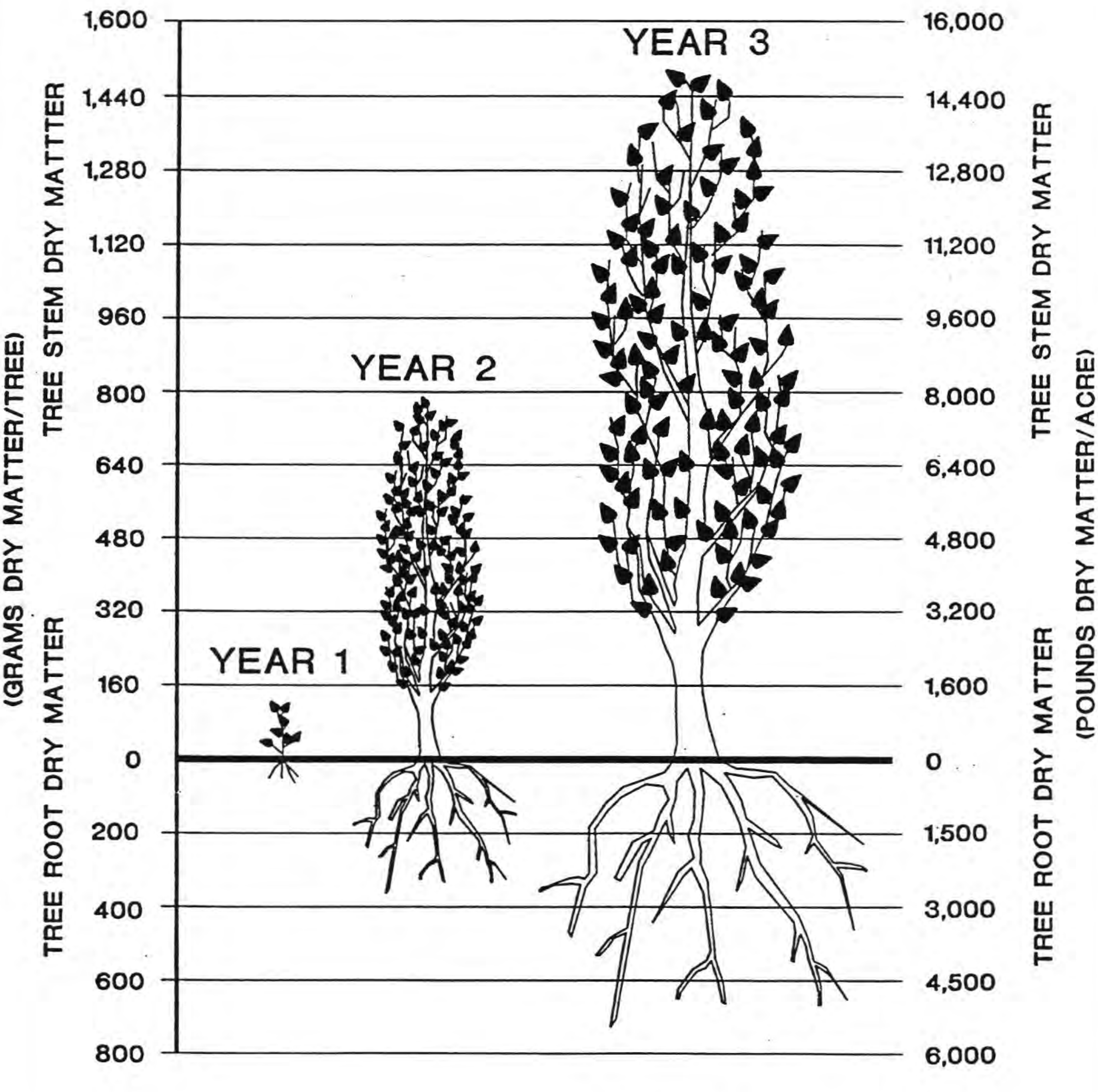

FIGURE 1
ESTIMATED TREE STEM AND ROOT GROWTH FOR 2178 POLAR TREES PER ACRE

CH2M HILL

ecolotree

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early November to December. Tree varieties are available that continue to grow and transpire after the killing frost. During dormancy, selected hybrid poplar species can survive severe climatic conditions such as root submergence, sub-zero cold, and wildlife browsing.

Poplar trees are phreatophytes, which means that their roots can grow below the water table. Due to their ability to grow in saturated conditions, poplars thrive in flood plains and wet soils. Poplar will also coppice, or regrow, from a cut stump. The trees can naturally regenerate as long as the fully developed root system is left intact. Therefore, options will exist for harvesting and replanting.

Irrigation of industrial wastewater with potentially toxic contaminants requires clonal varieties selected for exceptional vigor and nutrient uptake capacity. Such vigor will better ensure high tree survival rates and minimize the need for replanting. It will also minimize the potential for groundwater contamination due to crop failure.

Selection of clones would be based upon their good performance in the Willamette Valley as well as demonstrated resistance to *Septoria cancor* and other diseases and pests common to poplar trees.

Water Uptake

The growth rate increases as the tree emerges and eventually attains full canopy and root expansion. Accompanying the increasing rate of growth is the increasing water uptake rate, which changes dramatically over the first 3 years of growth. Planted as short cuttings at a density of 20 square feet per tree (2,178 trees per acre), the trees will grow to achieve full canopy in approximately 3 years. After the third or fourth year, all the available sunlight is being intercepted by leaves. Since this will, in turn, limit the evapotranspiration rate, the water uptake rate will remain relatively constant following canopy. Planned thinning and pruning will keep the density stress at an acceptable rate.

Table 1 summarizes the water uptake rate as a function of planting density. This relationship is illustrated graphically in Figure 2. It is evident that lower planting densities take longer to reach the maximum water uptake rate because of the greater time required to achieve full canopy development. Once canopy is achieved, the tree population can be reduced with only temporary decreases in the total transpiration rate.

Planting a grass cover crop can significantly increase water uptake capacity during the early years of operation. Table 2 summarizes the water uptake rate of a poplar tree stand with a grass cover crop between rows. This relationship is illustrated graphically in Figure 3. In this situation, the grass consumes additional water during the initial years of operation. As the tree canopy develops, the grass crop is increasingly shaded out until it is severely stunted from lack of sunlight.

As with other perennial plant systems, the water uptake rate for the Ecolotree Buffer also changes seasonally. Table 3 depicts the change in monthly consumptive water use for the combination of trees and grass planted at a density of 2,178 trees per acre. Table 4 illustrates this same function in terms of net irrigation requirement, which is defined as the difference between the consumptive use and effective precipitation. Due to varying irrigation efficiencies, it is necessary to apply some excess water to satisfy the net irrigation requirement. The amount applied is referred to as the gross irrigation requirement and is tabulated in Table 5.

Nutrient Uptake

The essential plant nutrients and growth stimulants required by hybrid poplar trees are summarized in Figure 4. As indicated in this figure, many of these nutrients are present in the wastewater stream.

Nitrogen, phosphorus and potassium are the primary nutrients required for plant growth; however, as indicated in Figure 4, optimum production can be attained only if all nutrients are present at the required level. Table 6 summarizes the recommended levels of each nutrient in the soil. The target levels for site management of soil nutrients would be in the medium to high range. The low data are for Year 1; the high data are for Year 3 and beyond, at 2,178 trees per acre. Table 7 summarizes the rate at which the trees will uptake nutrients from the soil.

Table 1										
WATER UPTAKE BY POPLAR TREES VERSUS PLANTING DENSITY										
Planting Density (trees per acre)	Growing Season									
	1	2	3	4	5	6	7	8	9	10
4,356	7.0	40.0	60.0	68.0	70.0	72.0	72.0	72.0	72.0	72.0
2,178	5.0	28.0	50.0	62.0	66.0	68.0	70.0	70.0	70.0	70.0
1,452	3.0	20.0	41.0	54.0	61.0	65.0	68.0	68.0	68.0	68.0
871	2.0	15.0	30.0	46.0	55.0	62.0	64.0	64.0	64.0	64.0

Table 2										
TOTAL WATER UPTAKE BY POPLAR TREES AND GRASS VERSUS PLANTING DENSITY										
Planting Density (trees per acre)	Growing Season									
	1	2	3	4	5	6	7	8	9	10
4,356	40.5	56.8	63.4	68.0	70.0	72.0	72.0	72.0	72.0	72.0
2,178	38.5	51.5	58.4	63.7	66.3	68.0	70.0	70.0	70.0	70.0
1,452	36.5	47.8	56.1	60.7	62.7	65.0	68.0	68.0	68.0	68.0
871	35.5	45.2	51.8	56.1	59.0	62.0	64.0	64.0	64.0	64.0

Figure 2

Water Uptake by Poplar Trees

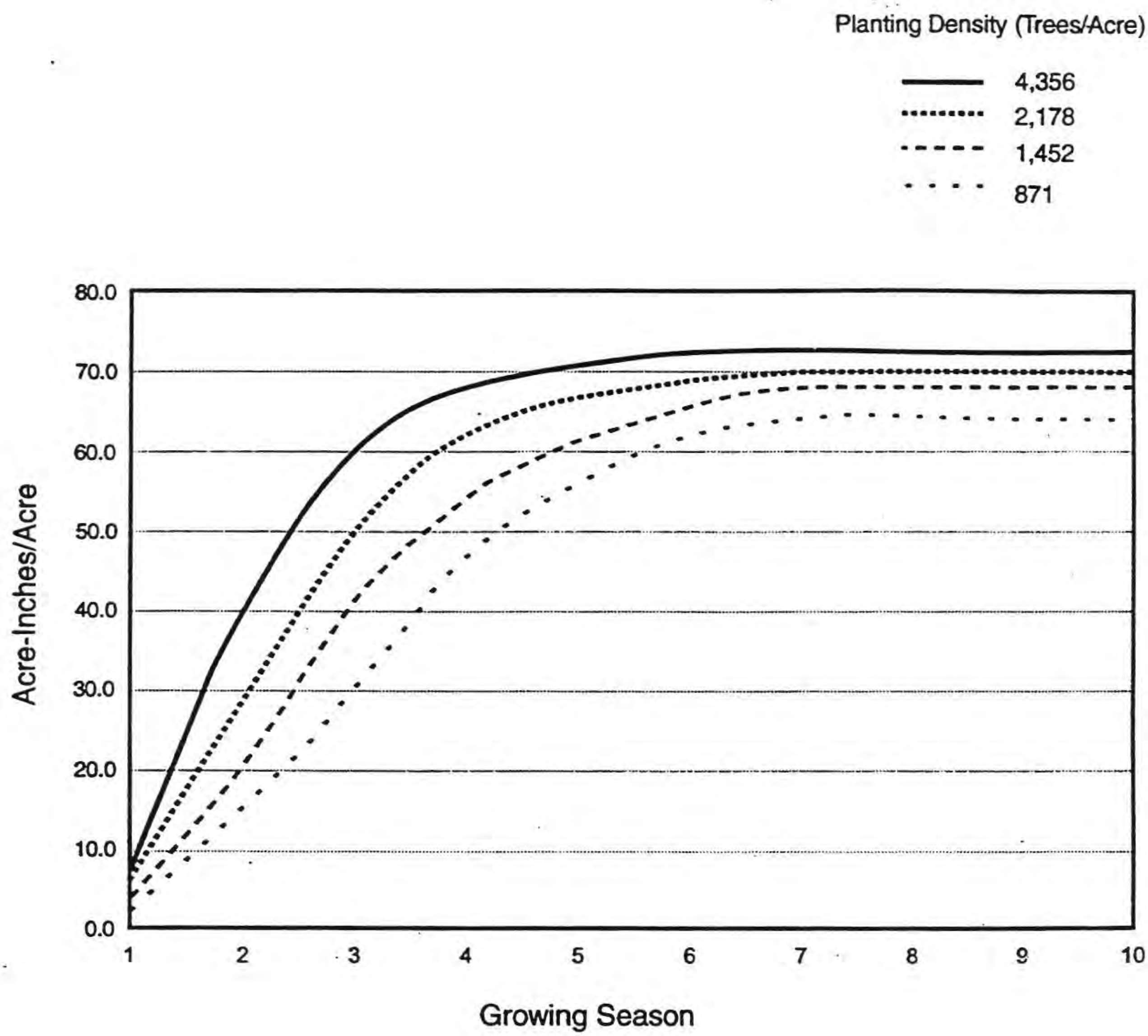


Figure 3

Water Uptake by Poplar Trees and Grass

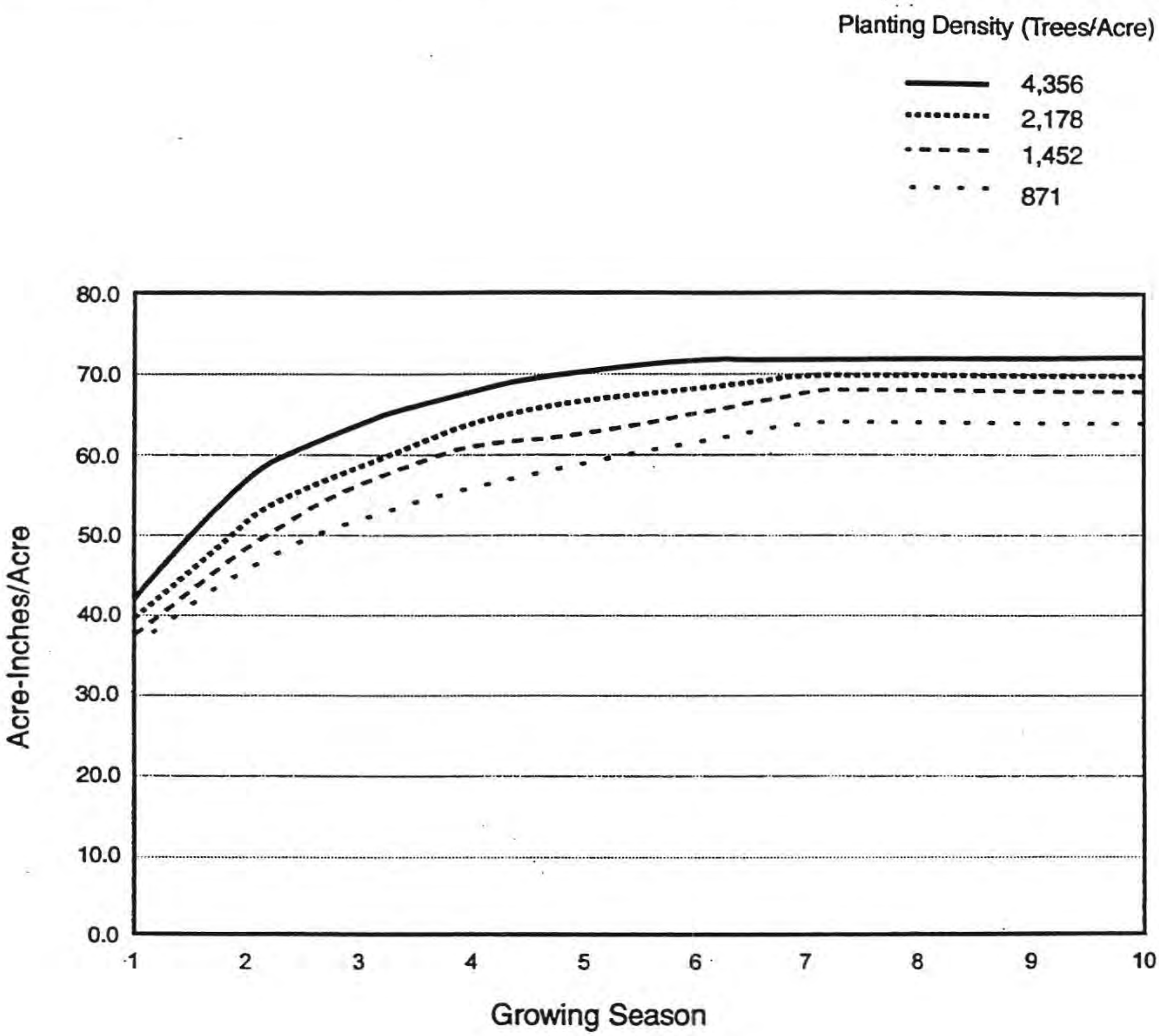


Table 3

Monthly Poplar Tree and Grass Consumptive Use (2,178 trees per acre)

Months	Inches									
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
January	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
February	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
March	1.76	2.35	2.67	2.91	3.03	3.10	3.20	3.20	3.20	3.20
April	3.29	4.40	4.99	5.44	5.66	5.81	5.98	5.98	5.98	5.98
May	5.00	6.69	7.59	8.28	8.62	8.84	9.10	9.10	9.10	9.10
June	6.34	8.47	9.61	10.48	10.91	11.19	11.52	11.52	11.52	11.52
July	7.93	10.61	12.04	13.13	13.66	14.01	14.43	14.43	14.43	14.43
August	6.52	8.73	9.90	10.79	11.24	11.52	11.86	11.86	11.86	11.86
September	4.69	6.27	7.11	7.76	8.07	8.28	8.52	8.52	8.52	8.52
October	2.26	3.03	3.43	3.75	3.90	4.00	4.12	4.12	4.12	4.12
November	0.71	0.94	1.07	1.17	1.21	1.25	1.28	1.28	1.28	1.28
December	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	38.5	51.5	58.4	63.7	66.3	68	70	70	70	70

Table 4

Monthly Net Irrigation Requirement for Poplar Trees and Grass (2,178 trees per acre)

Months	Inches									
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
January	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
February	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
March	0.08	0.11	0.13	0.14	0.15	0.15	0.16	0.16	0.16	0.16
April	1.72	2.41	2.78	3.07	3.21	3.30	3.40	3.40	3.40	3.40
May	3.91	5.49	6.34	6.98	7.30	7.51	7.75	7.75	7.75	7.75
June	5.78	8.13	9.38	10.33	10.80	11.11	11.47	11.47	11.47	11.47
July	7.84	11.03	12.72	14.02	14.66	15.07	15.56	15.56	15.56	15.56
August	6.52	9.16	10.57	11.64	12.17	12.52	12.93	12.93	12.93	12.93
September	4.41	6.20	7.16	7.89	8.25	8.48	8.76	8.76	8.76	8.76
October	1.76	2.47	2.85	3.14	3.28	3.37	3.48	3.48	3.48	3.48
November	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Dec	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	32.01	45.01	51.91	57.21	59.81	61.51	63.51	63.51	63.51	63.51

Note:

Net irrigation (NIRR) = consumptive use (CU) minus effective precipitation. Relationship between orchards' CU and NIRR for this region was used to obtain an estimate for NIRR for poplar trees. OSU guide for CU and NIRR was used to develop relationship for orchards.

Table 5

Monthly Gross Irrigation Requirement for Poplar Trees and Grass (2,178 trees per acre)

	Inches									
Months	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
January	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
February	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
March	0.10	0.14	0.16	0.18	0.19	0.19	0.20	0.20	0.20	0.20
April	2.14	3.02	3.48	3.83	4.01	4.12	4.25	4.25	4.25	4.25
May	4.88	6.87	7.92	8.73	9.13	9.38	9.69	9.69	9.69	9.69
June	7.23	10.16	11.72	12.92	13.50	13.89	14.34	14.34	14.34	14.34
July	9.80	13.79	15.90	17.52	18.32	18.84	19.45	19.45	19.45	19.45
August	8.14	11.45	13.21	14.56	15.22	15.65	16.16	16.16	16.16	16.16
September	5.52	7.76	8.95	9.86	10.31	10.60	10.94	10.94	10.94	10.94
October	2.19	3.09	3.56	3.92	4.10	4.22	4.35	4.35	4.35	4.35
November	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
December	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total	40.01	56.26	64.89	71.51	74.76	76.89	79.39	79.39	79.39	79.39

Note:

Gross Irrigation = net irrigation/ irrigation efficiency; irrigation efficiency = 80%

03-25-95

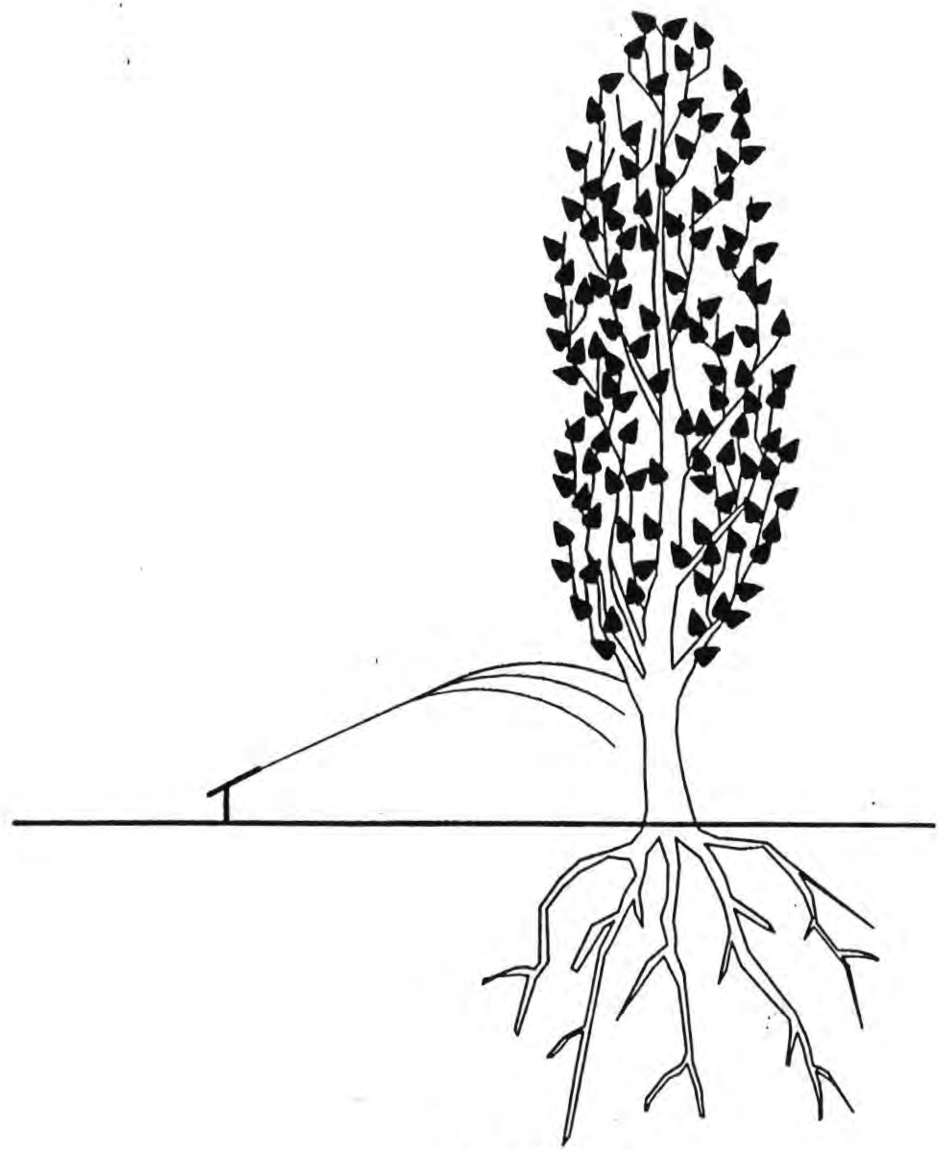
BASIC: CARBON* HYDROGEN* OXYGEN*

PRIMARY: NITROGEN* PHOSPHORUS* POTASSIUM*

SECONDARY: CALCIUM* MAGNESIUM* SULFUR*

MICRONUTRIENTS: BORON* CHLORIDE* COPPER* IRON* MANGANESE* MOLYBDENUM* ZINC*

GROWTH STIMULANTS: ARSENIC* COBALT* LEAD* LITHIUM* SELENIUM* VANADIUM*



* AVAILABLE FROM WASTEWATER

FIGURE 4
ESSENTIAL PLANT NUTRIENTS AND GROWTH STIMULANTS

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Table 6 Recommended Soil Nutrients for Poplar Tree Plantations				
Nutrients	Low (lbs/acre)	Medium (lbs/acre)	High (lbs/acre)	Very High (lbs/acre)
NO_3-N^-	54	126	180	216
NH_4-N	18	72	108	144
P	18	72	144	180
K	360	1,440	1,800	2,160
Ca	7,200	10,080	12,240	13,680
Mg	1,260	1,440	1,620	1,710
Na	360	540	900	1,350
Zn	1.8	5.4	6.48	7.2
Fe	14.4	18	36	54
Mn	7.2	18	25.2	32.4
Cu	1.8	3.6	5.4	7.2
SO_4-S	54	72	144	216
B	2.16	2.88	3.6	4.32

Table 7 Estimated Uptake Rate of Nutrients by Poplar Trees		
Nutrients	Low (lbs/acre/yr)	High (lbs/acre/yr)
Nitrogen	100	400
P	60	150
K	150	500
Ca	400	1,200
Mg	10	30
Na	1	3
Zn	3	10
Fe	5	20
Mn	7	15
Cu	2	5
SO_4-S	50	400
B	1	3

Appendix E
Financial Support Information

United States
Environmental Protection
Agency

Office of Water
Program Operations
Washington DC 20460

May 1984

EPA

Is Your Proposed Wastewater Project Too Costly?

Options for Small Communities

Wastewater Facilities For Small Communities A Tall Order

Providing wastewater treatment facilities to small communities is by no means a small task. According to a 1982 survey, small communities with populations less than 10,000 need more than $13 billion to comply with the Clean Water Act. Of this, $9 billion is for new sewers and $4 billion is for treatment plants. Clearly, clean water for the nation is essential, but expensive.

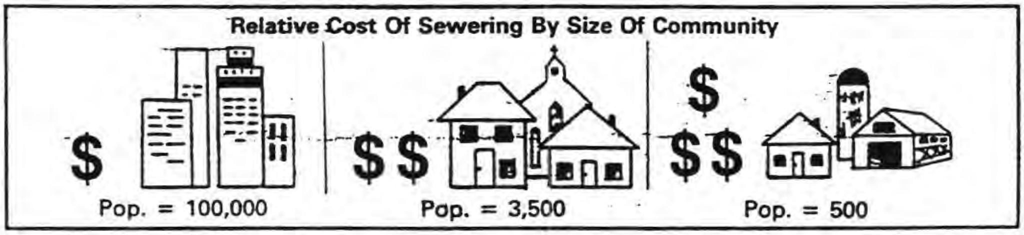
Some small community residents may have trouble understanding why large increases in their sewer bills are necessary, especially if their rates have been low in the past. Your existing facilities were likely built years ago when everything was less expensive. Perhaps the loan or bonds used to finance them have been paid off or are being paid through other means, such as property taxes. The only cost you may be paying now is for operation and maintenance. More importantly, old wastewater plants probably do not provide the high level of treatment needed to clean up the waters. Better treatment facilities to meet our clean water goals simply cost more to build and run. **Therefore, your increased sewer bill may be a reasonable price for the benefits to your community — cleaner water, better fishing and swimming, and a healthier environment.**

Most small communities find it difficult to afford conventional sewers and wastewater treatment plants. Since 1972, the U.S. Environmental Protection Agency (EPA) has paid 75% of the construction costs for most wastewater facilities. Beginning in October 1984, however, the EPA share will be reduced to 55%, and less EPA funding will be available for constructing collector sewers. States and local communities must assume a larger share of the cost of clean water.

What will this mean to small towns that need new or improved wastewater treatment facilities? Is it possible to reduce the financial burden without reducing the quality of treatment?

The Small Community Dilemma

Higher Costs Because of their size and layout, small communities face a heavier cost burden in building wastewater systems. Their size does not allow them to enjoy the economies of building large facilities. In other words, sewers and treatment plants cost more per house in a small town. Adding to this problem is the fact that a rural population is spread out, which means longer sewers are needed to serve each house. It costs twice as much per house to sewer a town of 3,500 than a city of 100,000 and three times as much for a town of 500.



Harder to Raise Capital. In addition to higher costs, smaller communities have more difficulty financing their facilities. Some common financial problems include:

- Lower Income - In general, annual incomes of rural households are about $3,000 less than urban households.
- Dependence on Residential Tax Base - Since there may be only a few commercial or industrial revenue sources in a small community, the homeowner often shoulders a greater share of the tax burden.
- Difficult Financing - Smaller communities often have difficulty qualifying for the bond market. Those that do usually have a low bond rating. Further, a small community is likely to pay a higher interest rate because of the smaller amount of the bond.

Management Problems. Most small towns have the resources and expertise to manage only simple wastewater systems. They seldom can get the skilled personnel needed for the project management, construction supervision, billing, accounting, budgeting, operations and maintenance necessary for a sophisticated treatment plant.

As you can see, selecting a wastewater treatment option, finding the best financial plan, and maintaining the necessary expertise to manage the system are extremely difficult jobs for a small community.

Choose Appropriate Technologies

How do you solve this dilemma? First, it's vital to keep costs down. The most important way to reduce wastewater facility costs is to choose the appropriate technology for your small community situation — a system that is simple and inexpensive to operate. In many cases this can mean simply modifying or upgrading the facilities you have now, especially onsite systems. If the cost of new sewers is a problem, your community should strongly consider different types of small diameter sewers, maintaining and upgrading septic systems, or using alternative onsite systems where septic systems are unsuitable. Cluster systems, which take septic tank flow to a suitable neighborhood treatment site, can also be used where onsite systems won't work properly. Appropriate systems for centralized treatment include ponds, lagoons, overland flow, trickling filters and oxidation ditches. These appropriate small community technologies are described more fully in the last section of this pamphlet.

Has Your Community Selected A Project With Reasonable Costs?

EPA has developed a screening system to help ensure selection of an appropriate wastewater treatment option. The system is based on an analysis of thousands of projects in EPA's biennial survey of needs in the construction grants program. The purpose of this system is to help your community identify problems at an early stage when they can be more easily resolved.

The EPA screening system consists of six financial indicators and has two parts (see below). Part A measures the reasonableness of your project's costs and sizing based on national experience. The cost indicators reflect what your community would pay to build the facilities without funding. Part B is a measure of the net cost of the project to the existing households. These costs assume a 25% local share of the project capital cost. Since costs vary in different parts of the country, your State's screening program may use different criteria.

Part A-Project Capital Costs And Sizing

Indicator	Suggested Criteria
Capital Cost of Sewers	$ 4000 per household
Capital Cost of Treatment	$ 3 per gallon per day of capacity
Total Project Capital Cost	$ 6000 per household
Allowance for Future Flow	50% of initial flow

Part B-Cost to the Residential Customer

Indicator	Suggested Criteria
Annual Operations and Maintenance Cost	$ 100 per household
Annual Household Cost	1.5% of median household income

The values of these indicators for your project are compared to the criteria based on national data or to your State's criteria. Both parts of the screening system are important; both the total cost of the project and its net cost to each household must be within acceptable limits. If your project exceeds the criteria for any of the indicators in Part A or Part B, your State will work with you to take a closer look at your project so that any problems can be analyzed and resolved. Contact your State officials for more information.

What To Do If Sewers Or Treatment Facilities Are Too Expensive

Reduce Project Scope. If the project you are planning is too costly, it may be possible to reduce its size. Take a hard look at the population projections and flow estimates. Be realistic about estimates of future growth and wastewater treatment needs and reevaluate the extent of sewering you propose. Can some pipes be eliminated by using onsite or cluster systems in outlying areas? A water conservation program may reduce wastewater flow and the size of the proposed treatment plant. It also may allow continued use of onsite systems. Another idea for communities expecting high growth is to construct the facilities in stages to spread out your town's investment over a longer time period.

Simplify Design. Often there are ways to simplify the design of facilities to cut costs and make operation easier. Make sure the layout of the plant is as efficient as possible and eliminate all non-essential features such as brick veneer walls on buildings and paved roads with curbs and gutters. Perhaps laboratory or other facilities, and even plant operators, could be shared with a neighboring town.

Improve Financing. Sometimes the cost to finance a project can be reduced. Be certain that all potential funding sources for the project have been considered. Some Federal and State agencies have low interest loans. To reduce interest rates, some States have bond banks or will guarantee local bonds. In some cases, extending the bond life can reduce annual costs. Your State water quality officials or Regional EPA staff may know of some innovative financing methods that could save you money.

Have You Chosen An Appropriate Technology?

A standard wastewater treatment facility may not be the best solution for your small community situation. A combination of approaches may be needed to solve different wastewater problems within the community. One or more of the technologies described below may be the most appropriate for your community. All are proven technologies currently being used successfully across the country.

Onsite Systems

Some communities have avoided sewers altogether by using systems that treat the wastewater at each homesite. Properly installed and maintained onsite systems will operate satisfactorily for twenty years or more in areas where site conditions are suitable. A management district can be set up to oversee operations.

Septic Systems. The most common onsite system is the septic tank, soil absorption system. This simple method settles out solids in a buried tank, which is cleaned every 3 to 5 years. Liquid flows from the tank to a drainage bed or trench and filters into the soil through perforated pipes.

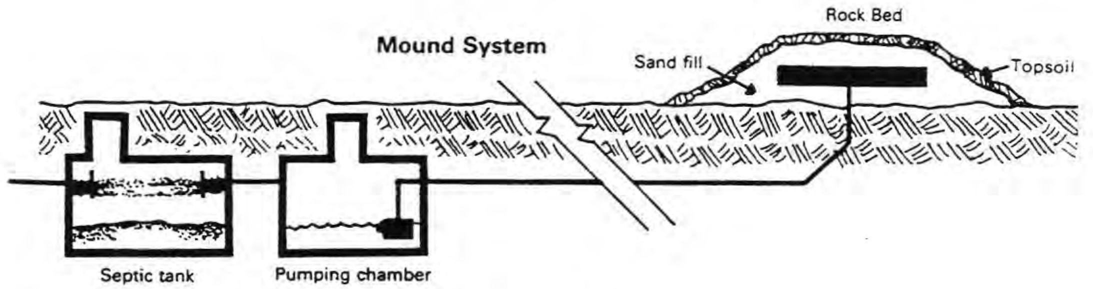
Alternative Onsite Systems. Several different types of onsite systems have been developed to operate in situations not suitable for conventional septic systems such as steep slopes, rocky or tight soils and high groundwater.

Aerobic System. This variation uses an aerobic tank instead of a septic tank to mix air with the wastewater for additional treatment before disposal.

Dosing. Some systems use a leaching bed or trench but pump the wastewater in measured doses to allow a more even flow over the entire distribution area.

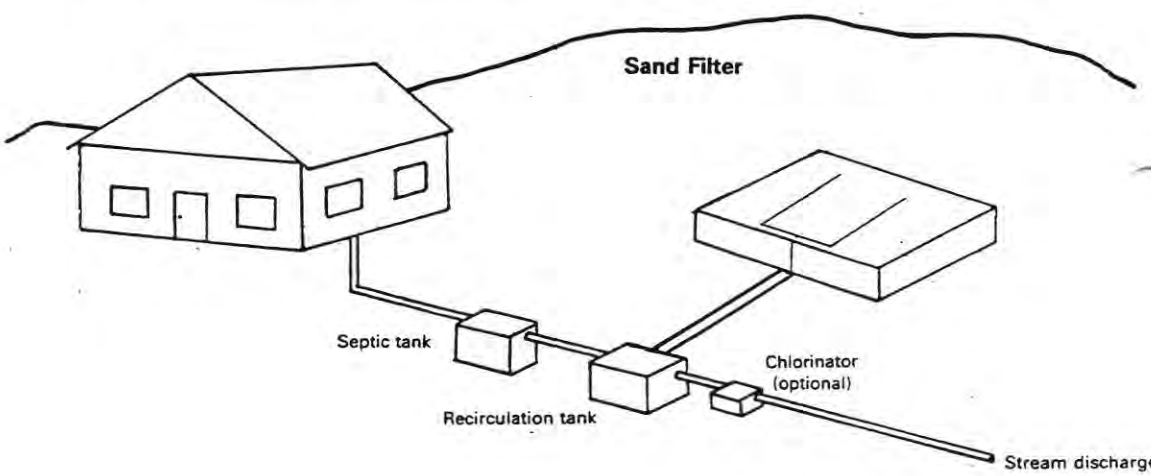
Alternating Beds. If space is available, two alternating absorption fields can be used so one can have time to recover its ability to absorb wastes.

Mounds. Where soils are rocky or tight or the water table is high, a mound can be created with fill material. The wastewater from a septic or aerobic tank is allowed to seep througl the soil in the mound, which provides the treatment.



E-T Beds. An evapo-transpiration (E-T) bed is similar to a mound but relies more on the evaporation of the wastewater through the bed and plant cover.

Sand Filters. Still another system which uses a septic or aerobic tank is a sand filter. A two to three foot bed of sand installed in the ground filters the wastewater from the tank. The filtered wastewater can be disposed through the soil or discharged to a stream. Some States require disinfection before stream discharge.

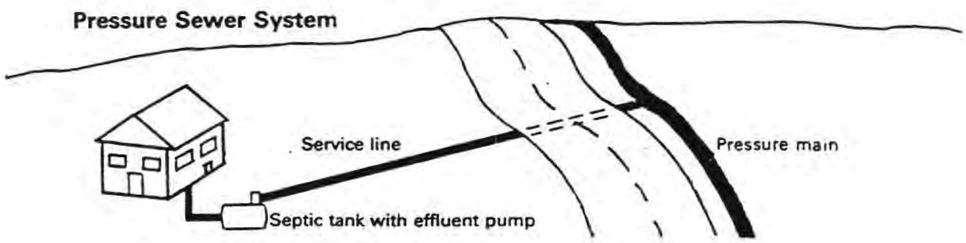


Alternative Sewers

Since conventional sewers are usually by far the major capital cost item of a wastewater system, alternative sewers should be carefully considered. Alternative sewers are smaller in size and are installed at shallow depths. Since they have no manholes and fewer joints, much less rain and ground water gets into alternative sewers so treatment plants can be smaller. One or more of the following alternative sewers are generally better suited for small communities than conventional sewers.

Small Diameter Gravity Sewers. Small diameter gravity sewers carry septic tank effluent. The pipes, which are usually plastic, can be small (4 inches in diameter) and placed at less slope than a conventional sewer. Operation and maintenance requirements are low.

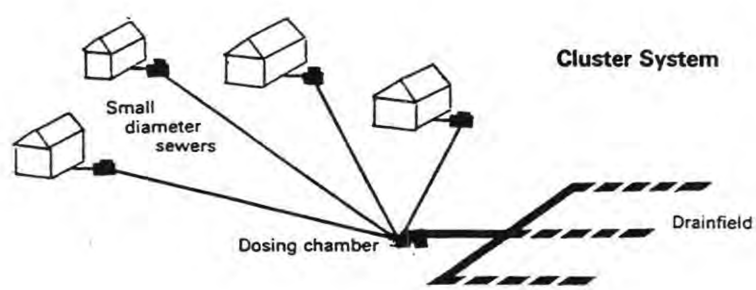
Pressure Sewers. Pressure sewer systems use a small pump at each house to move wastewater under pressure through small diameter plastic pipes to a treatment facility or a larger interceptor sewer. The pumps are of two types. Grinder pumps are housed in basement or underground tanks and grind the raw sewage while pumping it. The other type is the septic tank effluent pumping system, called STEP. STEP systems have less expensive pumps and have fewer problems with grease buildup than grinder pump systems.



Vacuum Sewers. In a vacuum sewer system, wastewater from each home is drawn through small collector pipes to a central collection station by vacuum. The vacuum collection station houses a pump which delivers the wastewater to the treatment facility or an interceptor sewer. Wastewater entry into the system is controlled by vacuum valves at each home or at groups of homes. Because of their limited ability to lift wastewater, vacuum sewers are best suited to flat areas where gravity sewers would be too expensive.

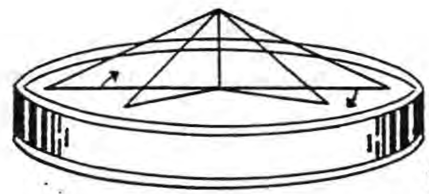
Cluster Systems

Where conditions are not suitable for onsite systems, cluster systems can be used. The most common form uses alternative sewers to transport either septic tank effluent from several houses to a common drainfield, or raw wastewater from several houses to a common septic tank followed by disposal. Treatment can also be provided by a pond, sand filter, mound or land application. Typically each cluster system serves a group of two or more homes but less than an entire community.



Low Cost Centralized Treatment

Some simple and reliable centralized treatment systems that are well suited to small con situations are ponds, lagoons, trickling filters, oxidation ditches and overland flow la treatment. All are well established methods for providing standard levels of treatment or In general, they cost less to build and run than the common method of treatment called ac sludge. They also use less energy and are easier to operate and maintain.



Trickling Filter

If your community is starting to plan a wastewater project, make sure the engineer you choose has experience with these small community technologies. If your ongoing project does not consider these technologies, a reevaluation of alternatives may be in order.

Putting in a wastewater system that effectively and reliably does the job, yet doesn't financially strap the community, is a challenge. This challenge can be met by making careful choices to keep down the cost of construction, operation, maintenance and financing.

MORE INFORMATION FROM

- **EPA National Small Wastewater Flows Clearinghouse**
  West Virginia University; Morgantown, WV 26506; 800-624-8301
- **Center for Environmental Research Information**
  26 W. St. Clair; Cincinnati, OH 45268; 513-684-7391
- **EPA publications** (call 202-382-7373)
  —Small Wastewater Systems–Alternative Systems for Small Communities and Rural Areas, FRD-10
  —Emerging Technology series of foldouts
  —Less Costly Wastewater Treatment Your Town
  —Financial Capability Summary Foldout—A Simplified Approach
- **Your EPA Regional Office**

1. Boston
(CT, ME, MA, NH, RI, VT); JFK Federal Bldg.; Boston, MA 02203; 617-223-7210

2. New York
(NJ, NY, PR, VI); 26 Federal Plaza; New York, NY 10007; 212-264-2525

3. Philadelphia
(DE, MD., PA, VA, WV, DC);6th & Walnut Sts.; Philadelphia, PA 19108; 215-597-9814.

4. Atlanta
(AL, GA, FL, MS, NC, SC, TN, KY); 345 Courtland St., N.E.; Atlanta, GA 30308; 404-881-4727

5. Chicago
(MI, WI, MN, IL, IN, OH); 230 S. Dearborn St.; Chicago, IL 60604; 312-353-2000

6. Dallas
(TX, OK, AR, LA, NM);
1201 Elm St.; Dallas, TX 75270; 214-767-2600

7. Kansas City
(KS, NE, IA, MO); 324 E. 11th St.; Kansas City, MO 64108; 816-374-5493

8. Denver
(CO, MT, WY, UT, ND, SD); 1860 Lincoln St.; Denver, CO 80203; 303-837-3895.

9. San Francisco
(CA, AZ, NV, HI, GU, American Samoa, Trust Territories of the Pacific); 215 Fremont St.; San Francisco, CA 94105; 415-974-8088

10. Seattle
(WA, OR, ID, AK); 1200-6th Ave.; Seattle, WA 98101; 206-442-5810.

EPA does not endorse, approve, or disapprove any system described here. Not all systems shown are approved by all jurisdictions. To get EPA funds, a project must meet Federal, State, and local standards.

Appendix F
Public Participation Information

Dallas Wastewater Improvement Project
Public Education/Involvement Plan

Purpose and Goal

This Public Education/Involvement Plan (PIP) outlines the City of Dallas' public participation program that will support the Dallas Wastewater Facilities Planning Project. This program is part of the City's dedication to educating citizens about wastewater problems and issues, informing the community of the status and results of facilities planning, and soliciting public input regarding alternative plans and the selected wastewater management program. The program's goal is to provide mechanisms that encourage two-way communication between the City's representatives and interested citizens to find constructive solutions for addressing the problems.

Background

The Problems

As Dallas continues to grow, its wastewater facilities that were originally designed to provide certain levels of services and protection of the City's environment will need to be expanded and improved. Identifying system improvements is particularly important because the City is under a Stipulation and Final Order (SFO) to comply with federal state effluent and water quality standards within an approximate 5-year period.

The facility plan, currently in progress, will identify deficiencies in the existing systems that need to be corrected to accommodate future growth and ensure that today's environmental standards are met.

System deficiencies include the following:

- Heavy rains during the winter result in periodic wastewater bypasses directly to Rickreall Creek and this violates Federal EPA and Oregon Department of Environmental Quality (DEQ) rules.

- Low water levels in Rickreall Creek during the summer months decrease the dilution benefits of the river, with a consequent increase in the likelihood of violation of state water quality standards.

- The sanitary sewer collection system and treatment plant capacity is limited by groundwater infiltration, pipe leaks, and rain inflow through roof drains, catch basins, and submerged manholes.

Future growth may necessitate the following:

- Construction of a new wastewater treatment facility and outfall that meets DEQ's water quality rules and that will not significantly impact surrounding land uses
- Expansion of the collection system to accommodate growth into new areas
- Identification of approximately __ acres of agricultural lands for treated effluent wastewater storage and disposal sites, and securing of rights through either purchase or long-term agreements for use of the properties
- Development of a financing package for facility improvements

Major Issues

Several issues related to system improvements include the following:

- Reducing summertime discharges into Rickreall Creek by either
  - Constructing a new advanced treatment plant
  - Constructing a pipeline and outfall to the Willamette River
  - Constructing effluent storage and irrigating agricultural fields with treated effluent
- Identifying a site, or combination of sites, to accommodate system improvements
- Providing public involvement opportunities
- Developing an acceptable financing program

Project Goals, Past Achievements, and Process Description

As mentioned previously, the City has initiated an ambitious program to solve its water quality problems. The program requires coordination, cooperation, and consensus among the public, the government, and the contractor. Project goals are as follows:

- Ensure the City's livability
- Involve the public throughout the program
- Comply with federal, state, and local government regulations
- Implement a financing program to provide the needed facilities

To date, the City has completed the following:

- The City Council adopted the water quality and facility improvement issue as one of its highest goals.

- The Mayor and City Council appointed a Citizens Advisory Committee (CAC) to assist in finding a solution to the issue.

- The City hired CH2M HILL to prepare the Wastewater Facilities Plan that will further define specific facility requirements, and to assist in developing and implementing a public participation program.

- The CAC has met monthly to address issues and provide recommendations concerning the wastewater project.

- A Sewer Capital Fund and State Revolving Loan Application was established by the City to build a reserve fund for ongoing planning.

Major project phases and key milestones and events to comply with the SFO are shown in Figure 1. The City's Wastewater Facilities Plan includes 12 tasks. To summarize, these tasks involve review of existing data, further evaluation of existing facilities, identification of needed system modifications, selection of a technological approach, establishment and application of site screening criteria for siting new facilities, development of a financing program, and implementation of a public participation program. Implementation of a financing program will be performed by others.

Affected Citizens and Others to be Reached

This public participation program is designed to reach different segments of the general public:

- Residents of Dallas and the surrounding areas in Polk County
- Elected and appointed officials of these jurisdictions
- Potentially affected property owners
- Environmental organizations
- Local community membership and service organizations
- Media
- State and federal agency representatives

Public Involvement Methods

The methods that will be used for informing the public and encouraging their participation throughout the project are summarized below.

Mailing List

Dallas wastewater rate payers are already on the project mailing list that will be maintained by the City. Dallas and Polk County officials, appropriate federal and state agencies, environmental organizations, local community membership and service organizations, and local media are also on the current list. If you wish to be added to the list, please notify:

> Mr. Dave Shea, Public Works Director, 187 SE Court, Dallas, OR; telephone number: 623-2338

Central Information Contact

Mr. Shea will serve as the project's central information contact to whom all questions, comments, and requests for information should be directed. All public information publications will include his name, office address, and telephone number.

Newsletters

One newsletter is scheduled for public distribution. The newsletter will announce upcoming events, summarize results of meetings and research, and provide other pertinent information. All parties on the mailing list will receive copies. Additional copies will be available at the information repositories identified below.

Workshops

Two public workshops are scheduled for the project. The purpose of the workshops will be to effectively communicate critical issues and research results to the public, and to afford members of the public opportunities to express their opinions, concerns, and recommendations.

The first workshop will focus on the project's background, and on the identification and discussion of critical issues. It will be held on March 15, 1993, at the Dallas Community Center, beginning at 7 p.m.

The second workshop will probably focus on treatment options, including effluent irrigation and treatment plant characteristics, and treated effluent and sludge application sites and their impacts. This workshop will also probably focus on proposed alternative systems and facility sites. The specific agendas, and the time and place for this workshop will be announced in the newsletter and through the media.

Public Hearing

A public hearing focusing on the Draft Wastewater Facilities Plan will be held following completion of a draft document. The date and time will be announced in future newsletters and through the media.

Responsiveness Summaries

Following each public workshop and the public hearing, a report will be prepared summarizing the issues discussed, the comments and recommendations made, and the City's responses.

Information Repositories

Newsletters, project announcements, and responsiveness summaries will be maintained and/or posted for public use at these locations:

- Dallas Public Works Department
- Dallas Public Library
- Dallas Community Center

Questionnaire

One hundred questionnaires will be distributed by the City in order to assess the effectiveness of the public participation program and identify how the PIP might be updated and improved.

Public Announcements

Announcements of all workshops and the hearing will be published in the *Itemizer-Observer*. The City will serve as the principal media coordinator.

Other Participants and Their Responsibilities

The key participants in the public participation program are the members of the public. It is the City's policy to encourage all affected and interested citizens to participate throughout the program. Other principal participants and their responsibilities include:

The CAC members include: "Blank" Responsibilities: Providing document and procedural review, and recommendations for the project.

Mr. Jim Smith, CH2M HILL Administrator and Mr. Mike Duvendack, CH2M HILL Project Manager. Responsibilities: Assure that CH2M HILL staff assists with the public participation program pursuant to contract obligations.

Mr. Roger Jordan, City Manager. Responsibilities: Ensure that the City's resources are available to assist in implementing the public education and involvement program.

Mr. David Shea, Public Works Director. Responsibilities: Assist all participants; provide City policy information; serve as central information contact and custodian of the mailing list.

Review and Update

The public participation program will be reviewed by participants as the program develops. Recommendations for modifications will be considered by the City and incorporated into the PIP if appropriate.

TO: Mike Duvendack/CVO
FILE

asked if the Council would know when authorization was given. Mr. Irick answered that this is between the Council and Mr. Jordan. Councilman Johnson said he didn't think that would be necessary since the Mayor or Council President also signs the check. Councilman Wright asked if the person using the stamp would be bonded. Mr. Jordan answered that all City employees are bonded, but Mr. Funk, who can use it is currently bonded for a higher limit. Mr. Jordan noted that Mr. Knox is not bonded for a higher limit, and he will look into that.

A roll call vote was taken and Mayor VanDenBosch declared Resolution No. 2555 to have PASSED by a MAJORITY with Councilman Wright voting NO.

Resolution No. 2556

> A Resolution authorizing the purchase of a parcel of real property from James C. Webster and Terri L. Webster and authorizing payment for said parcel of real property to be made out of the General Systems Development Charge Fund.

Mr. Jordan explained that the Council discussed the purchase earlier and the City finally got a legal description of the property, so they are ready to close the sale, and felt it best to have a resolution authorizing the purchase. A roll call vote was taken and Mayor VanDenBosch declared Resolution No. 2556 to have PASSED by UNANIMOUS vote.

PUBLIC HEARINGS

PUBLIC HEARING ON DEVELOPMENT PLANS TO UPDATE AND EXPAND SANITARY SEWER FACILITIES TO MEET NEW WATER QUALITY STANDARDS

The meeting then adjourned to the Civic Center at 8:07 p.m. for the Public Hearing on developing plans to update and expand the sanitary sewer facilities to meet new water quality standards.

Mayor VanDenBosch declared the public hearing open at 8:12 p.m. Mr. Jordan explained that this hearing is to start the public discussion about the problem with the sewer system and how the City can solve the problem. He noted that copies of the agenda for the hearing were available for everyone. Mr. Jordan indicated that it is critical to discuss this issue with the community so everyone knows the problem, which is that Rickreall Creek was changed to a limited water quality stream which affects the City's ability to discharge into the Creek in the summer when stream flow is low. Mr. Jordan noted that this is a process that a number of other Oregon cities are going through now.

Mr. Jordan explained that every household in Dallas was mailed a brochure describing the problem and some possible solutions. He noted that in the audience are some members of the Council's Utility Advisory Committee which helped in development of the brochure and which is involved in discussing the problem and possible solutions. Mr. Jordan indicated that the City needs to develop a plan to present to DEQ by the end of July. Mr. Jordan then introduced Jim Smith from CH2M Hill to make the presentation.

Mr. Smith noted that the politically correct terms are wastewater, not sewage, and bio-solids, not sludge. Mr. Smith indicated that there was a sign up list on the table that they will use as a mailing list for people interested in more information.

Mr. Smith reported that the problem statement has four parts. The City needs to conform to water quality standards, eliminate wet weather bypasses, upgrade existing aging facility deficiencies and accommodate planned growth. He explained that the City of Dallas and DEQ have entered into an agreement which includes a compliance schedule calling for the facility planning phase to be completed in 1993, with the design phase extending into 1995, and the construction phase ending in 1997, with start up and operations in 1997 also.

Mr. Smith reported that the current plant was constructed in 1969, and is a secondary treatment plant with a design dry flow capacity of two million gallons per day. In wet weather, the plant treats up to six million gallons per day. He noted that the plant has been well maintained. Mr. Smith explained that the discharge from the plant goes to Rickreall Creek and the plant was designed to meet effluent-based standards. He indicated that the standards are now based on stream quality, which can be affected by stream flow. He added that virtually every community in Oregon is facing the challenge of meeting these new standards. Mr. Smith then

Post-it™ brand fax transmittal memo 7671 | # of pages ▸ 2
To Jim Smith | From Marsha
Co. CH2M | Co. Dallas
Dept. | Phone # 623-2338
Fax # | Fax # 623-2339

9:17

reviewed the different ways of measuring water quality and the major issues of concern. He noted that an additional problem may be that the State Department of Fish and Wildlife may reclassify this area of Rickreall Creek as a salmon rearing stream, which would put more restrictions on effluent discharge into the stream.

Mr. Smith explained that one of the City's options might be to construct a pipeline and discharge into the Willamette River. He indicated that other options might involve using reclaimed water for irrigation for agriculture or golf courses, or for industrial reuse. Mr. Smith reviewed some of the optional routes for a pipeline to the Willamette River, noting that there is a point downstream of Eola Inn where there is an excellent location for effluent discharge. He added that part of the facilities plan will look at how the city will deal with the bio-solids. He explained that options include landfill cover, agriculture reuse, and compost or other stabilized dried product. He noted that there are a lot of regulations and monitoring involved with the reuse options.

Councilman Lamb asked if it was certain that Rickreall Creek will be declared a salmon rearing stream. Mr. Smith answered that he thought it was a good possibility since there are gravel areas that could be used for salmon spawning.

Glen Scatterday, a member of the Utility Advisory Committee, said he heard that if the City took the effluent out of the stream, there wouldn't be enough flow downstream and the City would have to look at increasing the flow. Mr. Smith responded that this is something that will have to be considered during planning. He indicated that it might be necessary for the City to increase the capacity of the dam or add more winter storage in some other away to allow for more flow in the summer. Council President Bevens asked about the requirement that users need to put back in what's taken out. Mr. Jordan answered that this was clarified by the State Legislature in the past and the City can do whatever it wants with the water it takes out of the creek.

During further discussion about the Creek being designated as a salmon rearing stream, Councilman Lamb asked if it would be in the City's best interest to fight this designation. Mr. Smith answered that it might be.

Councilman Woods asked how long a pipeline would be needed to discharge into the Willamette River. Mr. Smith answered that it would be 7½ to 8½ miles. Councilman Woods noted that there is high recreation use of the Willamette in the Eola area. Mr. Smith answered that the proposed area is downstream of the marina and below the recreation use point. During further discussion, Mr. Smith said that no one would see a visible discharge plume unless it was better quality than the river water.

At 9:02 p.m. the fire siren sounded and Councilman Johnson and Councilman Lamb left the meeting.

Marvin Parks, also a member of the Utility Advisory Committee, asked if a pipeline to the Willamette would be pumped or gravity flow. Mr. Smith answered that in some areas it would be gravity flow and in some areas it would require a low pressure pump because of friction pressure losses.

Councilman Bill Kliever asked what risk there is that future regulations might limit the City's ability to discharge into the Willamette River. Mr. Smith answered that the City's discharge is already going there via Rickreall Creek and the much larger flow of the Willamette can take more discharge. He indicated that the City's discharge would be a mere drop in the bucket compared to the flow volume and the amount others discharge into the Willamette.

There was then discussion about whether the City could pipe discharge to the system being used at the dairy farm at Rickreall. Mr. Smith indicated that there are different regulations for animal waste than for human waste because of the potential of human waste spreading disease.

Council President Bevens asked if it might be possible for the City to utilize a holding pond to hold the effluent for a month or so until the stream flow increased. Mr. Smith responded that the City would be looking at storage for three to four months.

Mr. Smith indicated that the next steps would be for the Council to develop and evaluate the options, send out a second information newsletter and hold a second information meeting, adopt a draft facility plan, hold a public hearing on the draft plan and submit it to DEQ. He indicated that any ideas should be given to Mr. Shea.

Mayor VanDenBosch declared the public hearing closed at 9:20 p.m.

OTHER BUSINESS

There being no further business, the meeting adjourned at 9:20 p.m.

Read and approved this ____ day of __________ 1993.

through the block grant program, but it would be relatively hard to compete for some of these grants since the City has already made some changes over the years, and is not in as bad a shape as some cities.

Councilman Jack Stefani moved to adopt the priority list in the report and to use it for implementing the changes in light of funds available in the budget this year and next. Mr. Jordan remarked that the study becomes the City's plan now. The motion was voted on and CARRIED UNANIMOUSLY.

PRELIMINARY POPULATION ESTIMATE

Mr. Jordan reported that the City received a preliminary population estimate from Portland State University. He indicated that as of July 1, 1993, the City has passed the 10,000 mark for the first time. He reported that the actual figure is 10,045. Mr. Jordan noted that this is within the planning projections the City has used. Council President Bevens asked if there were some bad points regarding required reporting with this change. Mr. Jordan answered that the City will have a lot more paperwork to do now that the population is over 10,000, and there are some new standards the City will have to comply with.

OCTOBER DEPARTMENT REPORTS

Mr. Jordan asked if there were any questions about the October department reports. He noted that Community Development Director John Barnard and Finance Director Del Funk were not in attendance because they were ill. There were no questions.

NOVEMBER 9 PLANNING COMMISSION MEETING

Mr. Jordan reported on the November 9 Planning Commission meeting. He indicated that the Commission approved, with conditions, a variance to allow a 1,488 sq. ft. accessory building at 438 SW River Drive. He explained that the next two actions involved the same property: approval of a street plan to serve future development and a partitioning at 750 SE Fir Villa Road. He added that there were ten conditions applied to the partitioning. Mr. Jordan reported that the Planning Commission also received and discussed information on the new state law requiring cities to allow siting of manufactured home on all land zoned for single family residential uses. He noted that this has been referred to the Citizens Advisory Committee for the Comprehensive Plan.

OCTOBER BILLS

There were no questions about the bills for October.

ECONOMIC DEVELOPMENT INFORMATION

Mr. Jordan reported that last Friday, Wal-Mart filed a site plan for locating in Dallas. He explained that the property in question already has a zone change approved, subject to Planning Commission approval of the site plan.

Mr. Jordan also reported that planning is being started for the performing arts stage at the Academy site. He reminded the Council that the City has leased the site from Chemeketa and Polk County, and funds for the project will be handled through the City's Park trust fund. Mr. Jordan indicated that Valley Community Hospital will be donating $10,000 for the project, and Rotary will be donating a matching $10,000. Mr. Jordan said he expected the design to be completed this winter and the construction done next summer.

PUBLIC HEARINGS

PUBLIC HEARING TO RECEIVE COMMENTS ON PREFERRED WASTEWATER IMPROVEMENT PLAN

Mr. Jordan commented that it would take a few minutes to prepare for the public hearing, since the City had planned to move down to the Civic Center if there was a large audience. He recommended a short recess while preparations were made. Mayor VanDenBosch declared a 5 minute recess.

Mayor VanDenBosch declared open at 8:01 p.m. a public hearing to receive comments on the preferred wastewater improvement plan. Mr. Jordan reported that the City sent out a third publication to Dallas residents explained the plan adopted by the Council and announcing this public hearing. He added that he recommends keeping the record open till the end of the month to allow people to get their comments in. He noted that there were two previous hearings which afforded opportunity during the design phase for people to comment, and there have been several articles in the newspaper. Mr. Jordan explained that staff is working with the Department of Environmental Quality (DEQ) to develop a plan acceptable to both the City and DEQ. He indicated that the final plan will be brought to the Council, which will be responsible for adopting it. Mr. Jordan added that representatives from CH2M Hill, the City's engineers, are present to go over the plan.

Mike Duvendack, Planning Manager for this project, introduced Jim Smith, Project Advisor; John Filbert, Senior Technical Advisor; and Kyle Snyder, Technical Assistant. Mr. Duvendack explained that the purpose of the hearing is to receive public comment on the proposed plan. He then reviewed the process to this point, explaining existing conditions and the proposed changes. Mr. Duvendack also reviewed the water quality and wet weather sewer issues and explained the options for treatment and disposal of liquids and sludge stabilization disposal options. He then reviewed the recommended improvements, and the proposed phasing. He noted that the first phase would be completed by 1997, and would include upgrading the existing facilities and provide capacity to meet current needs, constructing a pipeline and pump station to the Willamette River, and provided treated effluent for irrigation of farmland along the pipeline route. Mr. Duvendack indicated that the second phase would expand the facilities to comply with wet weather treatment standards and serve planned growth. He reported that the total cost would be $25.2 million, and explained that one reason for phasing the project is to make it an affordable project. He added that sewer rates will need to increase to approximately $37.00 per month by 1998 to pay for the project.

Mr. Jordan commented that several members of the City's Utility Advisory Committee were present in the audience. He explained that this committee provided important input in the planning phase and in development of the brochures that were mailed out. He said he appreciates their efforts. Mr. Jordan noted that this project will be the biggest public works project in the history of the City and will be the biggest challenge.

Pat Sougstad, Polk Soil and Water Conservation District, who lives at 683 W. Ellendale, came forward. She indicated that she is on the Utility Advisory Committee. Ms. Sougstad remarked that she has received some materials that indicate the Willamette Basin is being studied and it might be closed to effluent disposal in the future. She wondered what the City would do then. She asked if the planned improvements will accommodate growth, since she wouldn't want to see the City have to turn around and enlarge the plant right after the project was completed. She also asked what cities do that don't have a river to dump effluent into. Mr. Jordan responded that the City did consider the status of the Willamette when developing the plan. He indicated that the Willamette still has capacity, but the City can't tell if that will change in the future. He noted that it is a viable option at this time, and if this changes in the future, it would affect cities all along the Willamette, and there would probably be an increase in treatment requirements rather than discontinuing all discharges. Mr. Jordan reported that the plan calls for enlarging the system to accommodate for growth over the next 20 years or so. He explained that this is consistent with the planning done for other facilities. He added that the extra capacity is based on growth of 1.6% per year. He stressed that accommodating for this growth is not a major cost of the project.

Mr. Duvendack commented that municipalities that don't have rivers or streams to discharge to use either irrigation or some other alternatives.

Mr. Jordan reported that there might be the possibility of some grants and staff will be pursuing these.

Councilman Bill Kliever commented that one of the potential large users is the Oak Knoll golf course, and he asked if it would require special treatment, and whether the planned system would meet the requirements. Mr. Duvendack answered that it would depend on which category the golf course fell into. He explained that there are two levels, based on how much residential development there is in the area, and if the course falls under level 2 requirements, the treated effluent would be acceptable. Jim Smith added that this would be after phase 2 of the project is completed. Mr. Jordan noted that Oak Knoll is surrounded by agricultural land. Mr. Duvendack responded that there is a good chance the City could discharge effluent there for irrigation. Mr. Smith pointed out that the operators of the gold course would have some conditions they would have to meet such as not irrigating when people are on the course.

There being no further questions or comments, Mayor VanDenBosch declared the public hearing closed at 9:10 p.m.

There being no further business, the meeting adjourned at 9:12 p.m.

Read and approved this _____ day of ____________________ 1993.

____
Mayor

ATTEST:

____
City Manager

Dallas Wastewater Facility Plan

PUBLIC PARTICIPATION PROGRAM

Challenges to Maintain Dallas' Liveability

WHAT IS THE PROBLEM?

Rickreall Creek is one of Dallas' greatest environmental assets. It adds beauty to our City and parks, provides our drinking water, and assimilates our treated wastewater. We must protect and preserve this vital resource to maintain the unique liveability of Dallas.

Our present wastewater treatment system is no longer able to meet our needs. Built in 1968 to serve Dallas' needs for 20 years, the facility has served us well for nearly 25 years. Besides the need to replace worn out facilities, our treatment plant must be upgraded to meet new water quality standards, which are the result of Rickreall Creek being identified as a water quality limited stream.

WHAT WILL IT COST?

Project cost estimates have not been developed yet since we are still in the conceptual stage of the planning effort. However, it is highly probable that the final selected plan will require significant capital expenditures and will result in increased annual operating costs. Other cities that have recently faced similar challenges are spending millions of dollars to solve their problems. This need for significant capital and operational outlays will likely result in additional City bond funding and associated increases in user fees to implement and maintain the necessary facilities. While the City will apply for State and Federal grants and matching funds, we must not rely on current grant and loan programs.

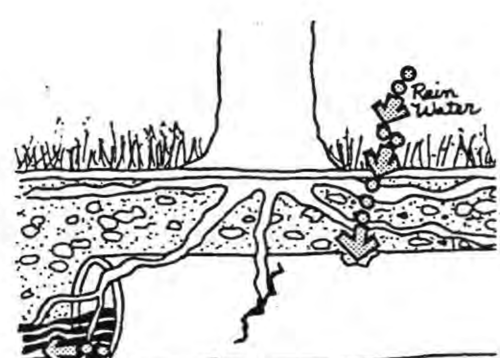
WE NEED YOUR HELP!

The timeline for action shown on the program schedule (page 2) is not negotiable. We must act now. All of our citizens need to be aware of and understand the problems we face and the possible solutions to those problems so that together we can select the best program for the City of Dallas.

Background and Challenges

State and Federal standards and laws that govern discharges into streams have changed. In fact, Rickreall Creek was recently added to the list of water quality limited streams in Oregon, which results in much more stringent effluent requirements. The water quality criteria may be too difficult to achieve both technically and economically during part or all of the year even with new facilities. These new criteria make the existing treatment facility and outfall obsolete.

Rainfall runoff from our buildings and paved surfaces, and treated wastewater from residences and businesses, eventually discharge



Aging, deteriorated sewers result in increased wastewater flows because of infiltration and inflow during storm events.

into Rickreall Creek. The stream has seasonal low water levels that are slow-moving in the summer. Although this gives the creek an appeal of its own, it also limits the capacity of the stream to handle the City's treated wastewater and other sources of indirect discharge. When Dallas was smaller, Rickreall Creek had enough capacity to handle our wastewater. But as our community has grown so has the volume of our wastewater. Now, the stream just cannot handle the wastewater during the dry summer season and comply with today's water quality standards.

In addition to our new stream water quality challenges, we also face the problem of old and aging wastewater management facilities. Our underground sewer system has deteriorated through the years, allowing rainwater to enter the pipes through cracks, bad joints, and other faulty connections. These conditions combine to cause excessive sewer flows and periodic discharges of untreated wastewater directly into Rickreall Creek during major storms.

To address these problems and meet our responsibilities, we have entered into an Agreement with the Oregon Department of Environmental Quality (DEQ) that defines a program and schedule to implement solutions to the water quality challenges.

Program Goals and Schedule

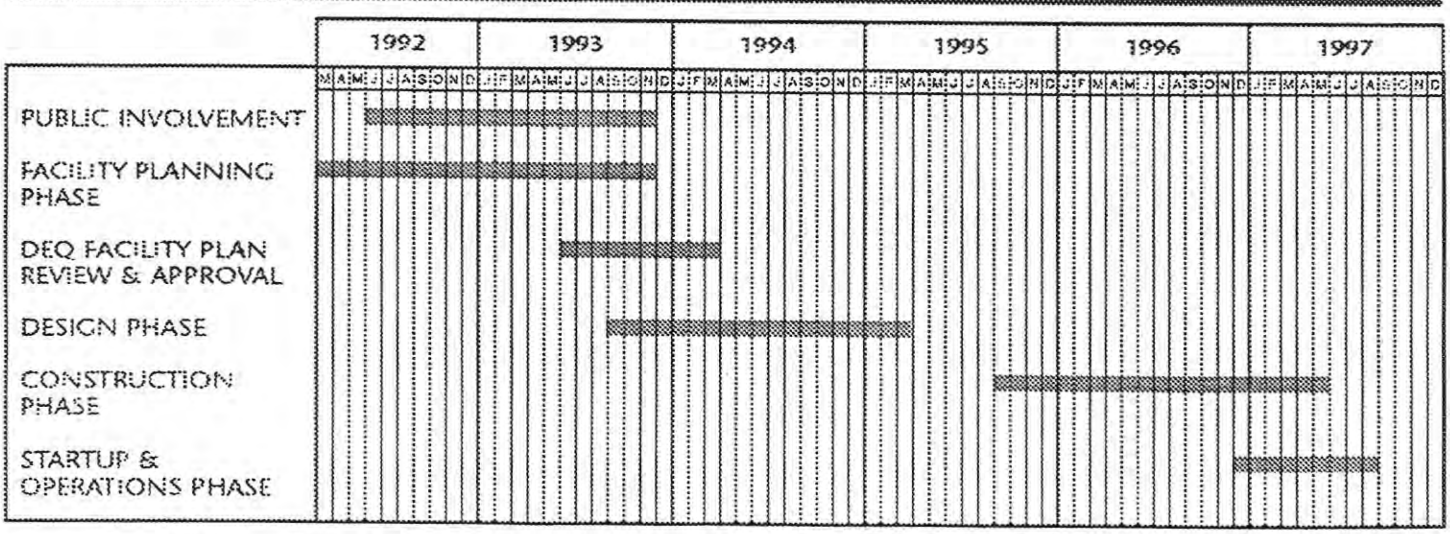
With the difficult challenges ahead, the City, our consultants, the State, and the people of Dallas need to work together as a team to define a plan which:

- has public support
- defines the full impact of the City's wastewater system on the water quality of Rickreall Creek
- provides necessary services to accommodate planned growth over the next 20 years
- conforms to State and Federal water quality standards in accordance with the requirements and schedule outlined in the City's Agreement with DEQ

The approximate schedule for the wastewater program is shown below. Our first milestone consists of completion of a Draft Comprehensive Facility Plan by the end of July 1993. Thus, between now and July we must work together to consider all options and select the best overall plan. Following completion of the comprehensive draft plan, a formal public hearing will be held.

The remaining schedule includes review periods for DEQ at various stages of the project. Thus, the completion dates for various activities may change depending on the time needed for review.

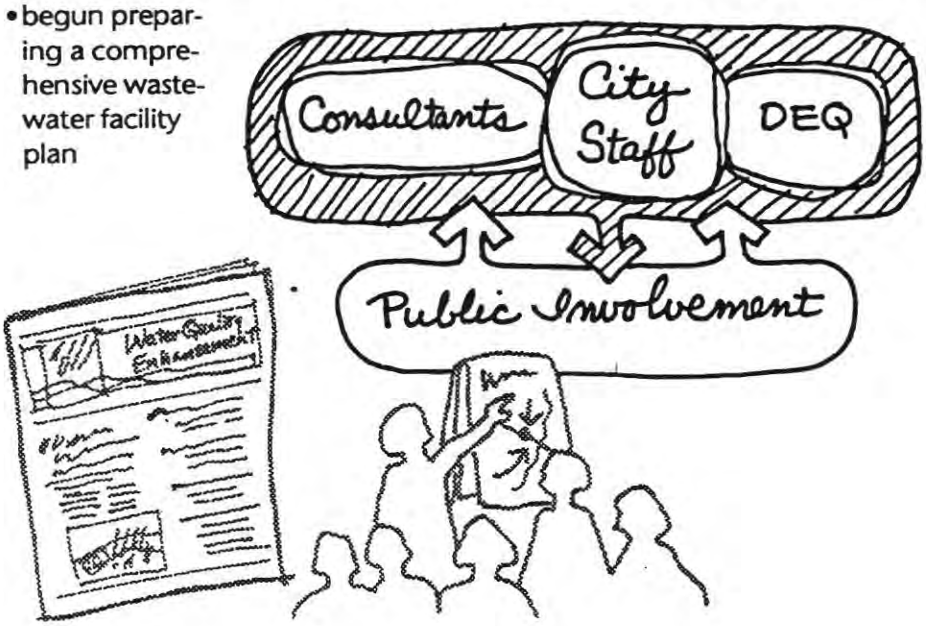
Dallas, Oregon, Wastewater Program Plan Schedule



Looking for Solutions

Our neighboring communities within the Willamette Valley and throughout the state face similar problems. Reducing the pollutants in our streams and rivers and preserving our area's liveability requires cooperation and effort from all our neighbors. Everything we do to improve water quality will improve conditions in our community and downstream. Likewise, our neighbors throughout the valley must do their part. Together, working cooperatively, we can meet the challenges facing us and preserve the liveability of our environment. To date the City has:

- entered into an Agreement with DEQ that establishes a timetable to comply with State and Federal water quality standards
- appointed a Citizens Advisory Committee (CAC) to assist in developing solutions; the CAC meets regularly with City staff, consultants, and others, and maintains an active role in guiding the City's discussions and decisions
- hired CH2M HILL, an environmental planning and engineering firm, to assist the community in developing solutions to our problems
- prepared a Public Education/Involvement Program to establish a process that keeps the community informed of progress and allows the citizens an opportunity to participate
- begun preparing a comprehensive wastewater facility plan



What's Next

The next step in meeting our environmental challenges is to complete the comprehensive wastewater facility plan by the end of July, 1993. The plan will define issues, develop solutions, and examine options in greater detail. The plan will include:

- a study of the sewer system to determine how much leakage can be economically eliminated from the underground sewer system
- a study of water quality in Rickreall Creek to determine what wastewater loads can be absorbed by the stream without violating water quality standards
- development and comparison of wastewater treatment and disposal alternatives to meet program goals and minimize costs to the community

To meet these challenges, the City needs your help. A team approach consisting of input from the public along with City staff, CH2M HILL, DEQ, and other agencies will be required to develop solutions that fulfill program goals. We encourage your thoughts, ideas, and participation in the process to develop a plan that is workable, will preserve the liveability of the community, and is cost-effective. The City's public involvement program includes newsletters, workshops, and other activities. A formal public hearing will also be held to discuss the Draft Comprehensive Facility Plan once it is completed.

Opportunity for Public Involvement

Monday, March 15, 1993
8:00 p.m.

The City needs your help in developing plans to update and expand its sanitary sewer facilities to meet new water quality standards. The first workshop presentation will be made by project staff at a special City Council meeting at the Civic Center located on the first floor of the City Hall Building, Jefferson Street entrance. The presentation will include information on:

- Problem statement
- Conditions of existing facilities
- Water quality issues
- Flow monitoring activities
- Options under consideration

The presentation will be followed by an opportunity for public questions and comments.

For further information contact:
Dave Shea
Director of Public Works
623-2338

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Dallas Wastewater Facility Plan

PUBLIC PARTICIPATION PROGRAM

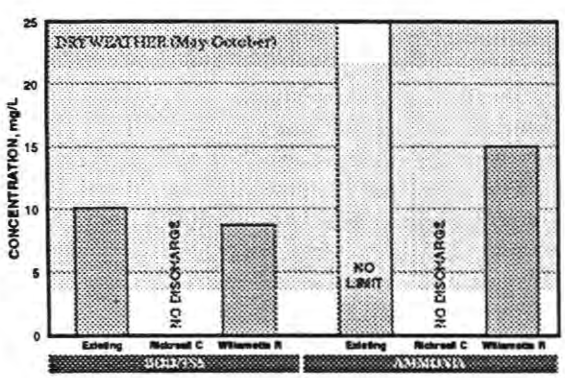
Overview Summary

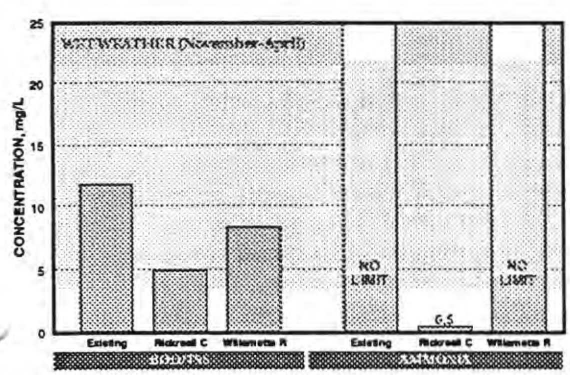
The City of Dallas faces some difficult challenges to maintain our unique liveability and provide the necessary wastewater facilities. These challenges are the result of the following project goals:

- Comply with new State and Federal water quality standards
- Upgrade and rehabilitate existing 25-year-old facilities and equipment
- Provide facilities required for planned future growth

The solutions to these challenges will need to include these wastewater system improvements:

- source control of generated wastes including reduction in infiltration and inflow
- expansion of the sewer collection system
- upgrade of the wastewater treatment facilities improvements in treated effluent disposal





Alternatives being considered for effluent disposal include: discharge to Rickreall Creek when allowed, discharge to the Willamette River, agricultural irrigation, and indirect potable reuse by pumping upstream to Mercer Reservoir.

These alternatives are now under evaluation. Based on very preliminary planning estimates, the capital cost to provide the necessary solutions may range between $10 and $30 million which represents the largest investment in Dallas' history. Options for funding the program will be explored, but it is clear, all will include rate increases. The City would like your help and input in selecting a cost-effective and reliable plan that meets our project goals.

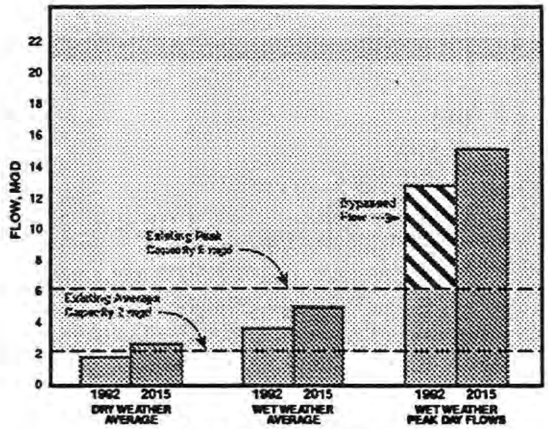
Recent Findings and Resulting Challenges

TREATED EFFLUENT LIMITS

Recent changes to water quality based criteria is the major factor in the need for wastewater system improvements. The Department of Environmental Quality (DEQ) established new limits for our discharge of treated wastewater to Rickreall Creek and other potential discharge points. The graphs at left show a comparison of the existing standards for discharge to Rickreall Creek with future standards for the creek and the Willamette River. During the dry weather season (May to October), discharge to the creek will be prohibited. During the wet weather season (November to April), discharge will be permitted but the new standards for the creek are more stringent.

SEASONAL HIGH FLOWS AND BYPASSES

The existing wastewater system cannot consistently transport and treat all of the wet weather flows that are generated. The following graph shows the current and projected flow levels, and the capacity of our current wastewater treatment plant. Treatment efficiency is reduced because the flows during wet weather exceed the average capacity. During peak wet weather flow conditions, excess flow is bypassed directly into Rickreall Creek. Infiltration and inflow from



leaky sewers and direct storm connections to the sewer are the main contributors to the high peak flows. Flow monitoring in the collection system indicates that it cannot transport all the peak flow to the treatment plant without backing up. Under the stipulated agreement with DEQ we must act now to correct these issues.

What are the Potential Solutions?

Over the past 10 months, the City has been analyzing environmental issues and developing solutions. Our engineers have examined various ways of solving our problems, including requiring pretreatment, eliminating stormwater, constructing new wastewater treatment facilities, and using various methods of disposal and reuse.

The City's goals throughout this process have been to:

- Enhance the liveability of our community by increasing water quality and conforming to State and Federal water quality standards
- Provide the cost-effective collection and treatment systems required to meet existing and future community needs by replacing obsolete and worn out equipment and expanding the system for future community needs.
- Involve the public in the planning process

Although the final plan has not been selected, it is now clear that the solution will need to include the following elements:

SOURCE CONTROL

The objective of source control is to decrease the pollutant discharge to our system and reduce excess wastewater flows caused by wet weather infiltration and inflow(I/I). Source control will include pretreatment for industrial sources, water conservation, elimination of illegal sewer connections like roof drains, and control of other sources of rainwater (I/I) such as leaky manholes and sewers.

COLLECTION SYSTEM IMPROVEMENTS

Collection system improvements will include upgrading and expanding the sanitary sewer system to eliminate overflows, control backups, and provide for future capacity. Short term improvements are needed to address the overflows problem while improvements to address future capacity may be phased over several years.

WASTEWATER TREATMENT AND DISPOSAL SYSTEM IMPROVEMENTS

Improvements to the existing wastewater treatment facility will be needed to serve future growth and conform to new Federal and State water quality criteria. We are currently examining a variety of sewage treatment and disposal options.

What are the Options for Wastewater Treatment, Disposal/Reuse, and Sludge Management?

We have defined the water quality issues during the facility planning process. We have also projected our future needs and defined the criteria and standards the new facilities will need to meet. Based on this information and public input, options have been developed for meeting our goals. Through a screening process which considered such things as reliability, flexibility, use of existing facilities, and cost, we have narrowed the possible wastewater treatment and disposal/reuse options to four basic alternatives. The following graphic indicates the system components anticipated for each alternative. The four alternatives are described below.

SUMMER AGRICULTURAL IRRIGATION WITH WINTER RICKREALL CREEK DISCHARGE

Water quality regulations will prohibit dry weather discharge to Rickreall Creek. Therefore, the option of continued discharge to Rickreall Creek is only feasible if it is combined with summer time agricultural irrigation. The alternatives of summer irrigation and winter discharge to Rickreall Creek compliment each other by reducing the amount of storage that otherwise would be required if either alternative were used alone. Nevertheless, the estimated storage required for this alternative is significant at 110 acres (10 feet deep). This alternative also carries some risk in that discharge to Rickreall Creek even in winter is based on having a sufficient quantity of creek flow. Irrigation is also dependent on several varying factors including the weather. The amount of acreage needed for irrigation to reuse treated effluent not discharged to the Creek is estimated at about 1,200 acres.

AGRICULTURAL IRRIGATION

Agricultural irrigation alone is also a viable option although the storage required would increase to 320 acres (10 feet deep). This would be equivalent to six Mercer Reservoirs. The storage is necessary because irrigation can only occur during the dry weather season when there is a crop demand. The land acreage required for this irrigation option would be approximately 2,400 acres, not including storage.

WILLAMETTE RIVER DISCHARGE WITH POSSIBLE SUMMER AGRICULTURAL IRRIGATION

The Willamette River has much higher flows than Rickreall Creek. Because of this we could discharge directly into the Willamette and still meet water quality standards. However, we would still need to improve the existing waste-water facilities to maintain water quality. One significant component of this option would be the construction of about 8 miles of pipeline and river outfall to transport the treated effluent to the Willamette River. Several routes for the pipeline are under consider-ation. The two that appear to be most viable are parallel to State Highway 22 and parallel to the Southern Pacific Railroad route, part of which has been abandoned. A possible added advantage of this option is the potential for summer irrigation on farmlands along the pipeline route.

	Conventional Secondary Treatment	Nutrient Removal	Filtration	Granular Activated Carbon	High Level Disinfection	Breakpoint Chlorination	Dechlorination	Post Aeration	Temperature Adjustment	Storage	Conveyance
Rickreall Creek	•	•	•			•	•	•	•	•	
Agricultural Irrigation	•				•					•	•
Willamette River	•									•	•
Indirect Potable Reuse	•	•	•	•	•	•	•	•	•	•	•

INDIRECT POTABLE REUSE

As indicated by the graph below, indirect potable reuse would involve treating the wastewater to very high levels of quality and then pumping the effluent upstream of Mercer Reservoir. In essence, the effluent would become part of the source for potable water for the City. The degree of treatment required to make this option feasible is significant and would be quite costly. Conservation of available water resources is the most significant benefit of this approach. This option also possesses significant risks with respect to maintaining acceptable quality of our water supply.

SLUDGE MANAGEMENT OPTIONS

Current sludge stabilization at the Dallas Waste Water Treatment Plant involves aerobic diges-tion and drying and storage in humus ponds. The dried sludge is hauled once a year to a local landfill for use as cover material. The current facilities are capable of meeting existing regula-tions for landfill disposal but not for use as final landfill cover which is controlled by regulations for land application.

The current facilities may not be capable of consistently meeting new regulations for land application of sludge that are more restrictive than for landfilling of sludge. Sludges must be treated to remove disease-causing organisms and to control attraction of disease-spreading pests for land application. Therefore, it may be desirable for the new treatment facilities to be designed with the capability of producing sludge suitable for either landfill or land applica-tion disposal. Sludge treatment alternatives are being developed to provide flexibility, maximize the use of existing facilities, and for cost effi-ciency.

What Comes Next?

The next major step is to select a plan. Planning efforts to date have collected information, monitored the existing system, modeled Rickreall Creek, and developed and screened alternatives. We are continuing to develop and refine the alternatives, estimate costs, identify environmental impacts and benefits, and outline a program to fund the project. At this time we do not have all the answers to these questions, but a summary of what to expect follows.

HOW MUCH WILL IT COST?

A substantial financial investment will be required to correct the deficiencies. Preliminary estimates put the capital cost at between $10 and $30 million. The majority of these capital costs will likely be expended during the next 3 to 4 years to comply with the DEQ compliance schedule. This will require a substantial increase in sewer rates. More details on the costs of the individual system options will be presented at the next public meeting.

HOW WILL WE PAY FOR THE PROGRAM?

All available options for funding the program are being explored including issuing revenue bonds repaid by sewer users, a low interest rate state loan, and Economic Development funds. It is clear that all funding options will include rate increases. However, every effort will be made to increase rates gradually over several years.

Opportunity for Public Involvement

Tuesday, June 29, 1993 — 7:00 p.m.

The City needs your help in finalizing plans to update and expand its sanitary sewer facilities to meet new water quality standards. A workshop presentation will be made by project staff at a special Public meeting at the Civic Center located on the first floor of the City Hall Building, Jefferson Street entrance. The presentation will include information on:

- Facility plan findings
- Potential solutions
- Wastewater treatment, disposal/reuse, and sludge management alternatives
- Cost and other impacts

The presentation will be followed by an opportunity for public questions and comments.

For further information contact:
Dave Shea
Director of Public Works
623-2338

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Dallas Wastewater Facility Plan

PUBLIC PARTICIPATION PROGRAM

City Council Adopts Recommended Wastewater Improvement Plan

On September 20, 1993, the City Council adopted the preferred wastewater improvement plan that will result in a cost-effective and environmentally sound solution to problems in our existing wastewater facilities. The goals of the improvement plan include:

- Compliance with new state and federal water quality standards
- Upgrading and rehabilitating existing 25-year-old facilities and equipment
- Providing facilities for planned future growth

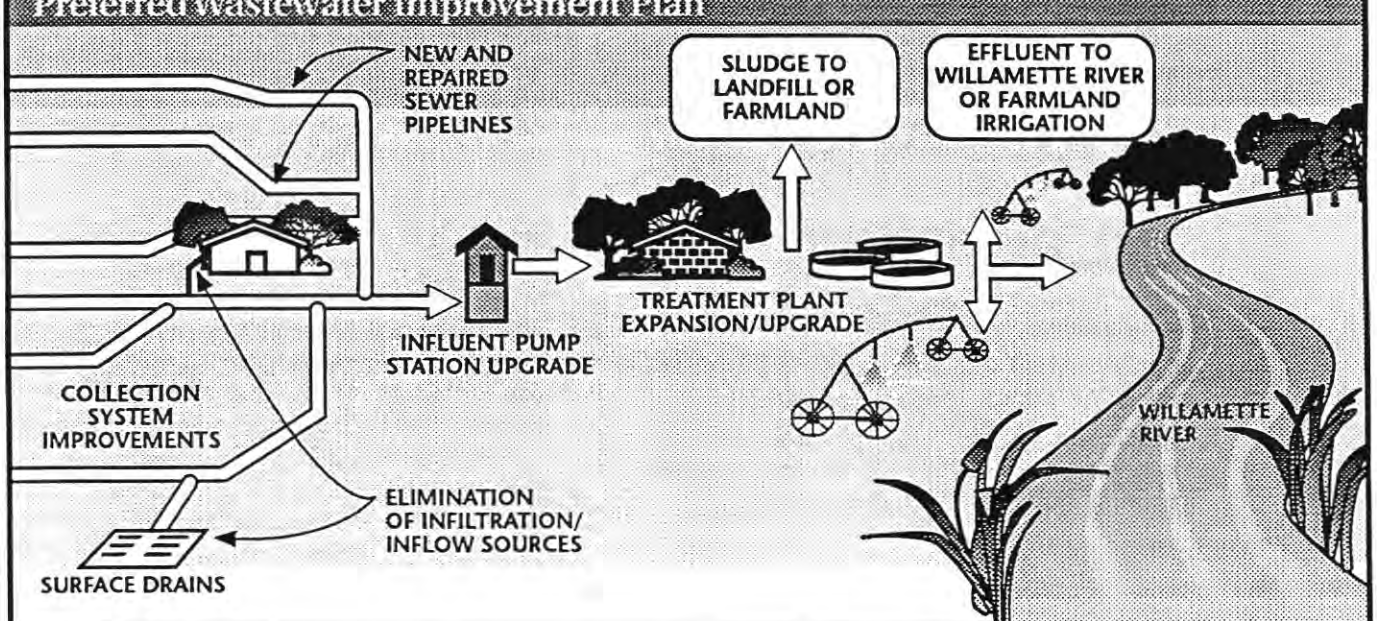
The preferred plan was developed during the wastewater facilities planning process, which began in July 1992.

Many alternatives were considered. An in-depth study of four of those alternatives was completed. The four alternatives were listed in the last public participation program publication that was mailed to your home. Copies of the previous mailer can be obtained at City Hall. The preferred improvement plan, shown

The preferred plan was identified as the most cost effective alternative

in the graphic below, was identified as the most cost-effective alternative. A financial analysis and further refinement of the preferred plan resulted in the selection of a phased implementation approach to make the plan affordable.

Preferred Wastewater Improvement Plan



Development of the Wastewater Facility Plan is the first step in complying with the agreement between the City and the State Department of Environmental Quality (DEQ) to correct existing deficiencies. A formal public hearing on the Facility Plan will be held November 15, 1993, at 8:00 PM in the City of Dallas Civic Center.

The preferred phased improvement plan recommends the following actions be taken:

Source Control —to decrease the excess flows caused by wet weather infiltration and inflow. This may include:

- Replacement of sewers
- Repair of sewer joints and manholes
- Elimination of illegal connections, such as roof drains

The improvements will be implemented in a phased approach over several years.

Collection System Improvements — to control wet weather overflows, minimize backups, and provide capacity for future growth. The collection system improvements will be constructed in two phases:

- Phase I — Upgrade of the main pump station located at the wastewater treatment facility to control bypasses at the plant.
- Phase 2 — New sewers to further reduce surcharging and address future capacity needs.

Wastewater Treatment and Disposal System Improvements — to conform to new federal and state water quality standards, upgrade existing 25-year-old equipment, and serve future planned growth. These improvements will be constructed in two phases.

- Phase I — Improvements would upgrade existing facilities and provide capacity to meet current needs.
  - Construct treatment and disposal facilities, including the pipeline and pump station to the Willamette River, needed to conform to water quality criteria.
  - Provide treated effluent for demand irrigation of farmland along the pipeline route.
- Phase 2 — Expand the new facilities to consistently comply with wet weather treatment standards and serve planned growth.

WHAT ARE THE COSTS OF THE PLAN, AND IS IT AFFORDABLE?

This will be by far the largest capital improvements investment the City has ever made, and requires a substantial commitment by the residents of Dallas. Cost estimates were prepared for each component of the preferred plan. A summary of the costs is presented in the table above. If the plan was implemented in a single phase, these costs would be expended over the next 3 to 4 years. To determine the feasibility of undertaking the plan immediately, a financial analysis was performed to determine the impact on the users.

Preferred Plan Capital Cost Estimates

ELEMENT	ESTIMATED COST (1993 $ - MILLIONS)
COLLECTION SYSTEM	
— New Interceptors	$2.3
— Source Reduction	3.7
TREATMENT SYSTEM	
— Liquids Treatment	11.7
— Liquids Disposal	5.0
— Sludge Treatment and Disposal	2.5
TOTAL PLAN CAPITAL COST	$25.2

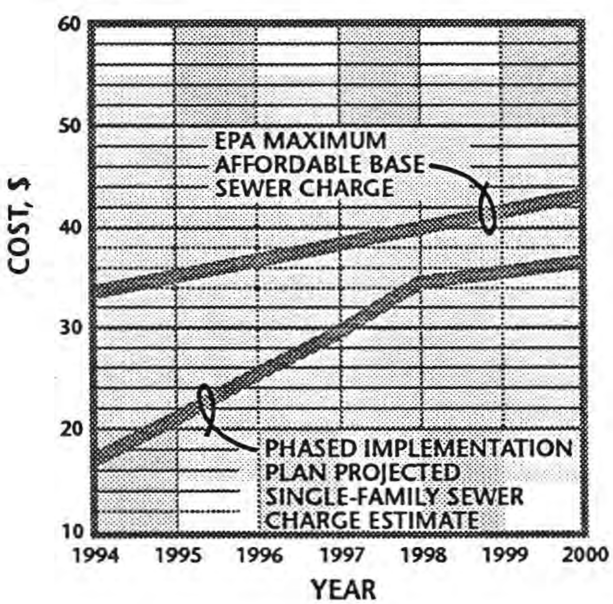
The City's ability to implement the improvement plan depends on its ability to generate enough income from the operation of the facility to secure long-term financing. The primary source for wastewater improvement funds is revenue generated through rates and charges. Because of the anticipated improvements required, the City has embarked on a program to increase the rates at 30 percent per year for four years, which will approximately double the single-family base monthly rate.

The most likely funding sources include State loan programs and City issued revenue bonds. In addition, the City is making every effort to identify grants to offset a portion of the cost. Even after maximizing the available sources, the analysis indicated that the City would face a shortfall if all of the planned improvements were implemented immediately. To generate the necessary loan funds for immediate implementation, the single-family base monthly charge would have to quadruple by 1998. The Council considers this to be unacceptable.

According to EPA criteria, the affordable rate for wastewater service is 1.5 percent of the median household income. For the City of Dallas, this affordability index relates to a maximum monthly rate of approximately $39 in 1998.

Immediate implementation of the entire preferred plan is not considered affordable.

This is far below the rate that would be required to implement the project immediately. Therefore, immediate implementation of the entire Wastewater Improvement Plan is not considered affordable. This conclusion led to the development of a phased implementation approach, which improves the affordability of the improvement plan.



PHASED IMPLEMENTATION OF THE PREFERRED PLAN

In developing this alternative implementation approach, the aim was to focus on high priority project components first, and phase in lower priority project components over time. We must meet water quality criteria and eliminate untreated sewage bypasses at the treatment plant as soon as possible. Therefore, the first phase would provide facilities to address these needs.

Improvements to the collection system to reduce infiltration and inflow would begin in Phase 1 and continue through Phase 2.

Phase 2 would provide the facilities to consistently achieve wet weather removal efficiency requirements, and provide for future growth and development of facilities for land application of sludge.

Phased implementation of the proposed improvements allows the capital expenditures to be distributed over several years, which results in a more gradual increase in the sewer rates.

WHAT DOES THIS MEAN TO THE RESIDENTIAL USER?

Phased implementation allows the single-family monthly base charge to stay within the EPA affordability index, which is 1.5 percent of median household income. The adjacent graph shows the estimated monthly base single-family sewer rate for the preferred Plan through the year 2000. The monthly base sewer rate is anticipated to double to about $35 (including inflation) by the year 1998 when the first phase of the program will be completed. Additional rate increases will be needed to keep pace with inflation and to complete Phase 2.

Our projected estimates assume commercial and industrial rates will increase in proportion to the residential rates, based on the City's present rate structure. As such, these projections are preliminary. Future studies will also address equity issues to ensure that each user class (residential, commercial, and industrial) contributes revenues in proportion to its use of the system. In addition, the City will be reviewing the flat rate single family sewer charge for adjustment based on amount of use of the system.

Phased implementation of the preferred plan is expected to keep sewer rates within the EPA maximum affordability index.

Opportunity for Public Involvement

Formal Public Hearing
November 15, 1993
8:00 PM
Dallas City Hall/Civic Center
187 S.E. Court Street

A formal public hearing to receive public comment on the preferred wastewater improvement plan will be held November 15, 1993. A brief presentation summarizing the comprehensive draft Wastewater Facility Plan will be provided at the formal public hearing. Come find out more about the plan and provide your input. Copies of the comprehensive draft Wastewater Facility Plan are available at the City Library and the Public Works Department at City Hall.

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State of Oregon
Department of Environmental Quality — Memorandum

Date: December 30, 1994

To: Steve Greenwood, Administrator Western Region

From: Jaime Isaza, Hearings Officer

Subject: City of Dallas Public Hearing

On December 15, 1994, the Department held a public hearing at the Polk County Court House in Dallas, Oregon. The purpose of the hearing was to receive public comments on the proposed Finding-of-No-Significant-Impact (FONSI) for the proposed wastewater treatment facilities (WWTF). The proposed FONSI is based in the Environmental Assessment (EA) released for public comment last November 9, 1994. The hearing started at 7 PM and Jaime Isaza served as the hearings officer.

A total of 18 people presented oral testimony: Mr. Joseph Hobson, Jr., Mr. Ron Marx, Mr. Mark Knaupp, Mrs. Michel Miller, Mr. Craig Rosenbalm, Mr. Edward Gresbreckt, Ms. Constance Albrecht, Mr. Brian Hewitt, Mr. Albert Bartok, Mr. Glenn R. Stoller, Mr. Greg Jenkins, Mr. Glen A. Scatterday, Mr. Gerald Gage, Mr. Paul Small, Mr. Ken Hale, Mr. Ron Quiring, Mr. John Thomas, Jr., and Mr. Bill Garland. Additionally, the following five individuals signed up to testify, although when called, they indicated that their concerns had already been addressed: Mr. Kenneth B. Quiring, Mr. Harold D. White, Mr. Claude White, Mr. Dean L. Freeborn, and Mr. Stanley G. Church. We also received 10 written statements from: Mr. Joseph H. Hobson, Jr., Mr. Ron Marx, Mr. Glen Stoller, Mr. Greg Jenkins, Mr. Glen A. Scatterday, Mr. Gerald Gage, Mr. Ken Hale, Mr. Al Denbowski, Mr. Roger Jordan, Dallas City Manager, and Ms. Shannon K. Relaford of Oregon Division of State Lands.

The Department also held a public information meeting on this subject on December 8, 1994 at the same location. Nine concerned individuals attended this meeting. Barbara Burton, Mark Hamlin, Richard Santner, and Jaime Isaza from DEQ were also present at this meeting.

Included, please find a summary of the public testimony and copies of the written comments received on this project. Also attached are the Department's response to comments prepared by Richard Santner.

Dallas Public Hearing Summary
December 15, 1994

Joseph Hobson, representing the farmers.

His clients own property and farm in the area affected by the project and their water rights will also be affected. The project has the potential to significantly affect the quality of the human environment, would violate state water law, and would commit public funds for a project that does not solve the problem. Principles of good public funding dictates that the solutions be long term.

Some of the specifics:
1) Removal of water from the creek would result in increased temperatures for the remaining water affecting several sensitive or special status species. The water table would also be impacted.
2) Water to be removed is now used for agricultural irrigation affecting prime farm land and would disrupt the actual reuse and replenishment system in violation of Polk Co. Comprehensive Plan and statewide planning Goal 3. Wetlands, the creek, and special status species would also be affected.
3) Existing drain lines, drainage tiles, and pipelines system that must be maintained at a grade and uniform plane would be disrupted. Removal of the drainage system would create soil permeability problem and destroy the productivity of prime agricultural land.
4) State law would not allow the proposed use of the reclaimed water, i.e. piping the water from the plant to the river to avoid the cost of treatment is not a beneficial use of that water. Proposal would also conflict with existing rights. Proposal cannot pass a public interest determination and state law does not exempt the project from those requirements.

The EA acknowledges direct and indirect environmental impacts and identifies loss of water flow as affecting irrigators who represent a unique and sensitive environmental resource. The EA however, dismisses these concerns as insignificant based on two invalid assumptions: State law allows the city to use and displace municipal water as needed provided ODFW is consulted about the effects, and that resolution of water quality, quantity, and rights issues are beyond the scope of the EA.

Piping water to the Willamette to avoid cost of treating is not a beneficial use according to ORS 537.120, 540.610. ORS 537.132 and 540.510 and 540.610 provide no exemption from that requirement. Delivery of water for anything other than a beneficial use is an invalid appropriation in violation of state law. The Department cannot approve or fund such a project. The proposed project should be amended to provide that if there is no agricultural demand, the water must be returned to the original outfall location for reuse of downstream users.

The project as submitted cannot stand a test for approval as an appropriation of surface water. The Water Resources Commission must reject an application which will be detrimental to the public interest or in conflict with existing rights per ORS 537.170, 537.160. The EA and the FP inappropriately assume that the law exempts the proposed use from the requirements because it involves reclaimed water subject to ORS 537.132. This is not valid because the proposed project does not anticipate a beneficial use and it is in violation of Goal 3 and the Polk Co. Comprehensive Plan; DEQ must determine that the application of reclaimed water will not have a significant negative impact on fish and wildlife in accordance to ORS 537.132(1)(b) and the EA acknowledges the existence of threatened or endangered species in or near the creek. Use of reclaimed water in another area will have a significant negative effect on those species and thus in conflict with this rule.

DEQ must determine that the water quality of the proposed receiving stream will be improved ORS 537.132(1)(c) which is an unlikely conclusion.

The project inaccurately assumes irrigation with reclaimed water which would be limited by the level of treatment, soil type, topography. Project should be redesigned to meet the long term goal of improvement of Rickreall Creek and adjacent environment.

Based on the EA it is unlikely that it can be concluded that water quality, water quantity, and water rights issues are beyond the scope of the document. The city does not have the right to complete this project and the state lacks the ability to approve it or fund it because of its significant negative impact.

Several questions must be answered such as: soil characteristics and suitability for effluent irrigation; environmental impact of effluent irrigation; potential for heavy metal buildup; crop types and suitability for consumption; effects of irrigation on protection and maintenance of drainline, pipeline, and conveyance system; and effects of reduced flows on habitat, wetlands, and special status species.

The proposed project is highly controversial OAR 340-54-050-(5)(a)(F) and should not be approved or funded by DEQ.

In behalf of his clients he disagrees with the FONSI based on the EA.

Ron Marx, farmer:

Farmer who irrigates bush beans, corn, sugar beats, clover, alfalfa, radish seed, strawberries, grains, and grass seed with Rickreall Creek water. He is concerned that with proposed project he will not have enough water to irrigate and that the quality of the water would be less than what he has now. Even if he could use water from the proposed pipeline, his crops would be restricted to non-food, water would have to be contained so it does not go to streams or ditches, and probably other as yet unknown costs and restrictions. It appears to him that the water quality of the Willamette River would be reduced and municipalities along the river would then be facing the same problem.

Reducing the flow in Rickreall Creek would reduce the quality of the remaining water. Present flows need to be maintained and the best approach is to clean the effluent and put it back into the creek. Dallas residents, agriculture, the local economy, wildlife habitat, and aquatic life would all benefit. He thinks reservoirs should be built to accommodate increasing demand. Reservoirs benefit everything and everyone.

Mark Knaupp, farmer:

Owns and farms 125 acres that include a right of way area that the pipeline would go through. He has two drain lines that cross under the railroad right of way to his property and a third one that goes to his neighbor. These lines connect the tile that drain his farm land. Any disruption to these lines would destroy their property to drain. Due to the size of the pipeline, there would be a severe impact to the drain lines creating a major economic and environmental impact. There are many other properties that have similar tile lines. There are three major outlets that were put in the last 30 years and many water lines that were put in since then and no one knows were they are. They could be damaged during the construction of the pipeline. There should be very serious considerations to the type of damage that would be caused by the implementation of this project.

Michel Miller, Rickreal resident:

Read EA and based on her knowledge of the area there is going to be a definite environmental impact. Taking water from Rickreall which is used for farmland is going to cause economic problems to their community including her husband, who won't have a job. Therefore there will be an impact to human, animal, and aquatic life. The EA does not fully address long term impacts of the pipeline. Dallas needs to clean their act up and do it the right way. They've chosen the easiest and cheapest solution which is not the one benefitting the community the most. Effluent needs to be cleaned up to a level that can be reused. At this time it cannot be used for human consumption crops. Her well is contaminated with coliform bacteria. Water table, which is very high, is going to be affected. If water is taken away, there will be long term damage to the wetlands. This bad idea is going to cost jobs to farmers of Polk Co. who put a lot of money into it. It is a bad deal for the environment and for the people who live in the area.

Craig Rosenbalm, Rickreall resident:

Resident since 1956 (family owns property since 1946). For the last 20 years they have suffered because of Dallas' sewage. Foresees human impact on the environment for the people living along the creek. Dallas residents are not affected because of their location above the effluent. The State is wrong to agree that there is not significant impact. It affects residents, farmers, and the Willamette River. The state and the country have been fighting to clean up the polluted rivers. The solution to the problem here is not to put more pollution to the Willamette. Rickreall should be preserved and improved and taking water away is not the solution. There is beaver [there] and salmon and trout runs have been lost. Recreational uses will be affected starting at Nismit?? Park. The creek is used for swimming, scouts activities. It is a bad proposal.

Edward Gresbreckt, Rickreall resident:

Retired farmer who has (had?) water rights to 20+ acres of land to farm strawberries, beans, and sweet corn. His concern is that if farmers use effluent water to irrigate all the land will be contaminated. If the water kills the fish now, it will kill all the snails and worms and farmers won't be able to sell their crops to canneries. Farmers are going to be shut off. Proposes a 10-12 in line from the river to the treatment plant and a motor to pump water up plus a filtering system and then put the water back into the creek for farmers to use.

Constance Albrech, resident of Dallas:

Has seen the FP and reviewed the EA. Sees some serious problems with the document. The assessment does not disclose the environmental impacts as required by law. Technically, it is a failure and not defensible under NEPA. EA is a poor rehash of the FP. Environmental and social impacts were not measured and thus cannot be analyzed or discussed as required by NEPA. The alternatives were not clearly defined, described, or compared based on data. Some alternatives were not even considered (this probably has to do with the history of the document). Examples of deficiencies are: no description of environmental impacts of water withdrawal from the creek, no maps of potentially impacted wetlands, no threatened or endangered species surveys, among others. Charts in the document assign numerical scores for environmental impacts but in portions of the EA it is stated that there is no environmental data of the site. What are these scores based on then? When there was no data, a zero score was given to environmental impact which is not legally defensible. Alternatives were not fully considered, i.e., there was not serious thought at reusing the effluent for agricultural irrigation done as close as possible to where the water is taken out of Rickreall Creek so that it does not impact its hydrologic regime. There is no description of the impacts from the sewer extensions which is a cumulative impact and should be analyzed. Sewer extensions usually bring more population and there are more impacts from that population. Economic long term impacts were not analyzed as they affect rate increases for Dallas residents, who pay for the project, nor who is going to benefit. There is not a cost-benefit analysis for economic and social impacts to Dallas and surrounding communities.

Technological issues are not explained such as tertiary treatment and its environmental cost versus the preferred alternative. Year round irrigation is not considered. What is Dallas going to do if chlorine cannot be used for disinfection in the near future? This question is not addressed. This project needs to be looked as a very large investment for the City of Dallas and, in spite of all the money spent already, a third more objective party (consultant) needs to be hired to look at the alternatives rather than having the same engineers that prepared the FP do the EA and probably do the final engineering design as well.

DEQ should do massive revisions to the EA or do an EIS. Environmental data collection and analysis needs to be done so that the real environmental impacts of the different alternatives are really identified. For instance, impacts of the proposed pipeline vs. some of the other alternatives. Economic impacts on the city need to be looked at as rate payers are the ones footing the bill which probably will be closer to 30 MM.

Brian Hewitt, farmer:

Concerned that it has taken so long to bring this issue to a public forum where there is opportunity for comments and suggestions from the citizens of Polk Co. Pollution is a problem that is not going to go away and all present are to be held accountable for the solution to that problem. The proposed pipeline is not the solution to their pollution problem but a transfer of the problem from point A to point B. Their problems will not be solved but will be transfered to others down the river. Such solution will cause greater and possible irreversible damage to their own basin. At present, water quality is poor at best and not acceptable due to inadequacy of current WWTP for present and any future growth.

Currently Rickreall Creek is a sustainable system which sustains steel head, cutthroat trout, other fish and aquatic life. The current system allows for use and reuse of water by many different groups and made possible by effluent release into the creek, use of water by farmers and then returned to the Willamette by a system of drains and tiles creating wetlands and wildlife habitat. Habitat will only be enhanced by better treatment of the effluent. The proposed pipeline will significantly reduce the flow of water in Rickreall Creek, up to 50% in critical months, and temperature will also be critically impacted affecting wildlife.

This is not a long term plan and does not address the solution to their pollution problem. Current water pollution should be addressed by treating the water to a higher level and cooling the water if necessary.
His family has been faced with the issue of implementing environmental solutions that were not the easiest or cheapest in their cattle operation to avoid contamination of Rickreall Creek. Present project should not become an "us vs. them", "city vs. rural" issue but one of "we are all in this together" issue.

Urges all to research all the solutions and their potential effects.

Albert Bartok, Dallas resident:

Has been observing Rickreall Creek for the last 3-4 years from his backyard. The creek provides a beautiful sight to residents and recreational opportunities for children. Great damage would be caused to the system by construction of the pipeline. Ecology in the stream at this time is damage free and should be kept that way. A pipeline is not a nice sight and the water supply should be increased by altering the amount of water that can be stored behind the reservoir upstream.

Glenn Stoller, Independence resident:

He is opposed to the piping of the effluent from the creek to the Willamette. The pipeline is a short term fix for a long term problem. If the water is not clean enough to be in the creek it should be cleaned up. Changing the dump site does not bring a solution. The recycling and reuse of the water is an important asset to the Willamette Valley and to Polk Co. There are restrictions in effluent water use for irrigation of food crops and the drainage conditions would not be met due to the nature of the soils of the area. Traditionally grown crops could no longer be farmed and crop rotation would no longer be an option. Fields irrigated with effluent water would represent a health risk to farmers due to pathogen content and other contaminants. The proposed pipeline will affect their drainage lines by cutting, blocking, and disrupting their grades. Fields will not be able to have effective drain systems. Clean and safe water is good for all and that is the solution. Drying up the creek does not make sense while sending the pollution to another river which has multiple uses. Every one needs to be protected not just the City of Dallas.

Greg Jenkins, Independence resident:

The land involved is prime farm land and has been for over a century which produces: fruits, vegetables, grains, hay, and pastures. Historically the land has been upgraded and improved for the betterment of mankind. Irrigation lines were installed to increase productivity, drain ditches and tiles to drain the water and let the excess water flow back to Rickreall Creek for others to use. His water rights, acquired by his grandfather, will be affected. Diversion of the water from the creek will destroy the wildlife that exists in the area. Lower water levels will result in higher temperatures killing animal species and causing algae [blooms] and stagnant water. Effluent will be too contaminated to irrigate current crops which would become unfit for human consumption. This project would destroy the lives of those who now make their living off the land. He concludes that there is a significant impact from this project and more time is needed to study the different alternatives. A moratorium on new housing construction should be implemented in Dallas until a long term solution can be found. There is no solution for pollution by dilution.

Glen Scatterday, Dallas resident:

Has seen the FP and the EA and is aware of the alternatives. The city and its officials should be congratulated on developing a workable plan that complies with the law, meets environmental regulations, has the lowest cost, and retains access to the treated water by downstream irrigators. At a cost of 16,000 dollars for each resident of the city, this is a heavy financial burden. The Clean Water Act mandates stringent requirements without providing financial assistance. Many others are in similar situations but Dallas situation is aggravated by the decision of OR FW to declare the creek a salmonid stream compounded by DEQ's demands for solutions within narrow time frames and without regards to conflicting regulations and the negative impacts in the community, a classic example of government out of control. This projects demonstrates that the citizens of Dallas are willing to meet their community and environmental responsibilities. The city has agreed to do anything reasonable to accommodate those down stream. He agrees with the plan and commends those who developed it.

Gerald Gage, Rickreall resident:

Unknowingly this project will destroy the ecology of two streams by reducing the flows in Rickreall Creek and contaminating the Willamette River with sewage. Sewage can be treated properly with present technology to protect the stream in a long term basis. The pipeline is just a dangerous and temporary solution. This plan is a costly temporary solution to the problem to be added to a costlier permanent solution to come at a later date.

There is no data to statistically back up the word "significant" in the document. The document also smacks of word advocacy and only did what Dallas wanted done. There is no reason to place any confidence in either the City of Dallas or DEQ and both appear to be avoiding the real issue.

Paul Small, Rickreall resident:

The proposed irrigation area also supplies the water for nearly 400 homes. There is a small shallow water aquifer that Rickreall pumps their water from. There is a chance that this water will become contaminated. Rickreall water right issues have been debated for years between Rickreall and Dallas. The issue has been in court and it was determined that water had to come back into the creek for irrigation. The water needs to be cleaned up and put back into the creek.

Ken Hale, Dallas resident:

Disagrees with the FONSI. He is concerned with the long term human health and ecological effects in Rickreall Creek. There will be negative ecological impacts due to increased temperatures specially during the summer months and the problem would be compounded if the flow is removed from the creek. Irrigation below the reservoir will virtually be eliminated resulting in economic impacts to the area and its residents. The proposed plan will not make the creek a healthy stream. The proposed plan is not a long term solution to the problem and it is likely that the Willamette will face the same problem in the near future as Rickreall now does. Watershed management would be a better approach benefitting both the streams and the residents of Polk Co. Watershed management would be a great opportunity for DEQ to develop an integrated solution to the creek's water quality problems benefitting people, fish, and wildlife. A 1-3 years delay to develop an integrated watershed management plan is worth it.

DEQ mandated Dallas to solve the pollution problem in isolation from the whole issue. The city did its best and put together an affordable plan. The plan does not solve the creek's problems and the real issue, that is watershed problems, is not addressed. The plan should be revisited to address its significant impacts and taking into consideration other stakeholders in the basin. Encourages DEQ to reject the report.

Ron Quiring, Rickreall resident:

His property would be condemned to make way for the pipeline. Questions the EIS? [EA] as field studies were limited to cursory field observations by the consultants without even consulting with property owners. He is not satisfied with the amount of effort that was put in the field investigations that support the document.

John Thomas, Independence resident:

Pipeline has to cross the creek in his property and how [this will be done] is yet to be determined but of most concern is that "rural land owners are feeling the steel boot of the tyranny of urban Oregon". Rural land owners are going to have to sacrifice to provide a solution to an urban problem which is unfair. Dallas has to address the issue of degradation of property value and this will probably be in court.

Bill Garland, Dallas resident:

Resident of the area for 60 years. Has been fishing the creek for 52 years. For the past 50 years Rickreall has been the cleanest he has ever seen it. The water should stay in the creek unless it pollutes it but if it is not polluting it now it should not pollute it later.

Al Dembowski, Rickreall resident:

The City should follow recommendations from Aaron Mercer for its planning. A short term solution is a mistake. The final plan should cover at least the next 100 years. Recommends an Environment[al] Impact Statement.

Roger Jordan, City manager:

On behalf of the city, encourages the Department to issue a FONSI. For nearly two years, Dallas has looked for potential alternatives that will bring the city into compliance with environmental standards. The plan represents the best alternative identified. The City does not agree with the law and rules that apply to Rickreall Creek.

Oregon Division of State Lands

Project may involve lands or interests managed/regulated by the Division and will need more details of the plans before making any determinations (i.e., wetlands, removal/alteration or more than 50 cubic yards of material within bed/banks of state waters)

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December 12, 1994

Jaime Isaza
Project Officer
Western Region Water Quality Division
Department of Environmental Quality
1102 Lincoln Street, Ste. 210
Eugene, OR 97401

Re: State Revolving Fund Loan to:
City of Dallas
P.O. Box 67
Dallas, Oregon 97338

For Construction Of:
Construction and improvement of the wastewater treatment facilities and collection system and construction of an effluent pipeline to the Willamette River

SRF Project Number C-412611-93

Dear Mr. Isaza:

This office represents Louie Kazemier, Dean Freeborn, Mark Knaupp, Claude White, Brian Hewitt and Glen Stoller. My clients herewith tender the enclosed comments with regard to the above referenced matter.

If you have any questions in this regard or need to contact our clients, please contact the undersigned. Thank you for your attention to this matter.

Yours truly,

LIEN, HOBSON & JOHNSON

By: Joseph H. Hobson, Jr.

JHH/tmh

December 12, 1994

Jaime Isaza
Project Officer
Western Region Water Quality Division
Department of Environmental Quality
1102 Lincoln Street, Ste. 210
Eugene, OR 97401

Re: State Revolving Fund Loan to:
City of Dallas
P.O. Box 67
Dallas, Oregon 97338

For Construction Of:
Construction and improvement of the wastewater treatment facilities and collection system and construction of an effluent pipeline to the Willamette River

SRF Project Number C-412611-93

Dear Mr. Isaza:

The following comments are directed at the Finding of No Significant Impact (FONSI) and the underlying Environmental Assessment (EA) performed on the above referenced proposed Oregon Department of Environmental Quality action under date of November 9, 1994.

These comments are submitted on behalf of the parties whose names appear below.

The individuals named own property and farm in the area affected by the proposed project. Their property and water rights would be affected by the proposed project. They own drainfields and pipelines that would be affected by the proposed project. They submit these comments based upon their personal knowledge and understanding of the physical characteristics of the area which will be affected by the project.

CONCLUSION

We disagree with the Finding of No Significant Impact as suggested by the Environmental Assessment. As indicated by the following comments, the proposed action does have the potential to significantly affect the quality of the human environment.

COMMENTS

The proposed action would remove water from Rickreall Creek. The EA concludes that the project will have no significant environmental impact because it will have a significant beneficial effect as a result of the elimination of the effluent discharge to Rickreall Creek. A significant environmental effect may exist even though the proposed action has an overall beneficial effect. The fact that the project will remove effluent laden water from Rickreall Creek does not balance or lessen the fact that the project will have significant environmental effects.

Removal of water from Rickreall Creek will result in increased temperature levels for the remaining water during warm low flow summer periods. The EA indicates that the creek is habitat for several sensitive or special status species. Besides anadromous fish, these include several amphibians and reptiles that are dependent on adequate water quantity and quality which includes temperature. The removal of such a large quantity of water from the subbasin will also affect the water table.

The water which will be removed is now being used for irrigation in addition to other uses. The water used for irrigation returns to the creek via an extensive system of underground drainage tiles and pipelines together with above ground conveyances. Those pipes and ditches nearly all drain back into Rickreall Creek. Removing the water from the subbasin will disrupt this reuse and replenishment system. This system has been in effect for sometime and constitutes the status quo. Disruption of that system will affect the prime farmland which depends upon this reuse and replenishment system for protection and maintenance in violation of the Polk County Comprehensive Plan and statewide planning Goal 3. It will also affect the wetlands and Rickreall Creek itself which benefit from the return flow from this reuse and replenishment system. It will also affect the special status species acknowledged by the EA whose habitat consists of those wetlands and the creek itself.

According to the proposed project, the pipeline will be buried across and will transect the existing matrix of drainage tiles and pipelines. The tile and drainage system must be maintained on a grade and on a uniform plane in the area of the proposed pipeline. The level of the majority of the existing drainage systems and the level for the proposed pipeline are the same. It would be impossible to continue to maintain and use the drainage system in that situation. The drainage system cannot be removed without creating soil permeability problems which would reduce or even destroy the productivity of the prime agricultural land in question.

The Environmental Assessment acknowledges that displacement of the outfall from the Dallas water treatment facility to the Willamette River will have both a direct and an indirect environmental impact. Environmental Assessment 28, 32. It also identifies loss of water flow in Rickreall Creek as affecting irrigators who withdraw water downstream from the existing outfall and admits that they represent a unique and sensitive environmental area or resource. Environmental Assessment 34. The Environmental Assessment dismisses these concerns as insignificant and reaches the conclusion that the proposed action will not result in a significant environmental impact based on two invalid assumptions:

A. State law allows the city to use and displace municipal water as needed provided ODFW is consulted about the effects. Environmental Assessment 28, 32.

B. The resolution of water quality, quantity and rights issues are beyond the scope of this environment assessment. Environmental Assessment 34-35.

Those assumptions are invalid because state law does not allow the intended use of the water and because water quality, water quantity and the interplay between those concerns and water rights is the primary focus of controversy and community concern over this project and is therefore clearly within the scope of this Environmental Assessment.

State law does not allow the proposed use of the water for the following reasons:

A. <u>Beneficial Use.</u>

State law provides that all water must be applied to some beneficial use. ORS 537.120, 540.610. The provisions of ORS 537.132, 540.510 and 540.610 provide no exemption from that requirement. Piping water from the

Dallas treatment facility directly to the Willamette River to avoid the cost of treating it is not a beneficial use. Adding on-demand agricultural use of the water while in transit does not change that fact. Delivery of water to anything other than a beneficial use is an invalid appropriation in violation of state law. As we understand the proposal, if no agricultural demand surfaces or if demand slackens or stops for a period, delivery would be to the Willamette River. This department cannot approve or fund that sort of project because it sets out to violate state law. In order to meet the requirements of state law, the proposal must be amended to provide that in the event no agricultural demand develops, or in the event demand drops, even temporarily, the water must be returned to the original outfall location for reuse by other water users downstream along Rickreall Creek. There can be no delivery to the Willamette River. That is not a beneficial use of the water.

B. <u>Public Interest/Conflict with Existing Rights.</u>

State law provides that any person intending to acquire the right to the beneficial use of any of the surface waters of this state must make application for a permit to make the appropriation. ORS 537.130. The Water Resources Commission must reject an application which will be detrimental to the public interest or which would conflict with existing rights. ORS 537.170, 537.160. The proposed project would take irrigation water from prime agricultural land in violation of the polices of the Polk County Comprehensive Plan and statewide planning Goal 3 which seek "to preserve and maintain agricultural lands". Removing irrigation water from agricultural land reduces its productivity. That is contrary to the goal of preservation and maintenance of those lands. That is the determination of the public interest in this matter. Therefore, the proposed project does not survive the public interest determination. Also, the proposed project would result in conflicts with existing water rights downstream as admitted in the facilities plan and the Environmental Assessment. The project as submitted therefore cannot stand even a threshold test for approval as an appropriation of the water involved.

The Environmental Assessment and the facilities plan may inappropriately assume that state law exempts the proposed use from the requirements set forth above because it involves what applicant considers to be reclaimed water subject to ORS 537.132. The exemption provided by that statute is not available to this appropriation for four reasons:

A. As outlined above the proposed project does not anticipate a beneficial use. ORS 537.132 provides no exemption from the beneficial use requirement.

B. As outlined above, the proposed project is a violation of Goal 3 and the Polk County Comprehensive Plan. ORS 537.132 provides no exemption from Goal 3 or the Comprehensive Plan and the consequent adverse public interest determination.

C. In order for the provisions of ORS 537.132 to apply, the Department of Environmental Quality must determine that the application of reclaimed water will not have a significant negative impact on fish and wildlife. ORS 537.132(1)(b).

(1) Threatened or Endangered Species.

The Environmental Assessment acknowledges the existence of certain threatened or endangered species in or near Rickreall Creek. Included are several amphibian and reptile species dependant on water quality and quantity. The Environmental Assessment admits that the proposal will have a negative effect on water quantity which in turn will affect water quality leading to a negative impact on those species. Use of the reclaimed water in another area will thus have a significant negative effect on wildlife in Rickreall Creek from which the water was appropriated and the department cannot make the required determination.

(2) Agricultural Use of Reclaimed Water.

The draft Environmental Assessment admits that the reclaimed water may be used by agriculture only under certain limited conditions. If those conditions are not met, use of the reclaimed water in those areas would negatively impact wildlife. The necessary conditions do not exist in the proposed project area. Most of the soils in the project area have low permeability. A majority of the agriculture in the area must have large and/or complex drainage systems in order to function. Such systems attest to the low or slow permeability of the areas soils. Soils that take water in so slow will cause irrigation water to puddle on the surface making effluent filled irrigation water susceptible to surface runoff which will move the effluent back to Rickreall Creek or area wetlands. The drainage systems cannot be removed without compounding the sc ermeability problems. The project proposal would produce water with too many solids to use existing technology to reduce application rates. Therefore, use of the reclaimed water in the proposed project area would have a significant negative impact on fish and wildlife and the department cannot make the required determination.

D. In order for the provisions of ORS 537.132 to apply, the Department of Environmental Quality must determine that the use of reclaimed water is intended to improve the water quality of the receiving stream. ORS 537.132(1)(c). The proposal under review would pipe sewage directly to the Willamette River. This is the same sewage which if deposited in Rickreall Creek, would degrade that stream. The Department has not determined that piping it to the Willamette instead would improve the water quality of the Willamette. It seems unlikely that such a conclusion could be reached.

Water quality, water quantity and water rights are inextricably intertwined in this project. It goes without saying that water rights affect water quantity. The Environmental Assessment admits that water quantity affects water quality. Finally, poor water quality in Rickreall Creek is the reason for the proposed project in the first place. It therefore seems unlikely that one could reach the conclusion that the resolution of water quality, water quantity and water rights issues are beyond the scope of this Environmental Assessment. Successful public review of this project begs a complete review of its impact on all of those elements and establishment of solutions for the problems uncovered. Simply put, given the current state of water rights and water availability in the area, the city does not have the right to complete this project and the state therefore lacks the ability to approve it or to provide a revolving fund loan for its completion because the shortage of water means the project itself will have a significant negative impact on the environment. An issue of that importance and issues flowing therefrom can hardly be said to be beyond the scope of this Environmental Assessment.

Environmental effects of the proposed project have not been adequately studied or analyzed. Several questions must be answered:

1. Are the area soil characteristics proper for use of the effluent?

2. What impact would irrigation use of the effluent have on the environment?

3. What is the potential for heavy metal buildup in the soil using the effluent?

4. What crops can be grown using the effluent and would its use foreclose use of the land for food for human consumption?

5. What effect will irrigation use of the effluent have on protection and maintenance of the drainline, pipeline and conveyance systems in place in the area?

6. What effect will reduced flows in Rickreall Creek have on habitat for special status species?

7. What effect will reduced flows in Rickreall Creek have on protection and maintenance of the integrity of the area's irrigation system including, but not limited to, the drainline, pipeline and conveyance system which currently reuses and returns the water to Rickreall Creek and its wetland areas?

8. What effect will reduced flows in Rickreall Creek have on maintenance and protection of prime agricultural land in the area?

9. What effect will construction and maintenance of the proposed pipeline have on maintenance and protection of the existing drainline, pipeline and conveyance system?

Based upon the above, the department's rules preclude a finding of no significant impact for this project.

A. The project will significantly affect the pattern and type of land use because of its impact on agriculture in the area. OAR 340-54-050(5)(a)(A).

B. The effects of the project's construction and operation will conflict with state water law. OAR 340-54-050(5)(a)(B).

C. The project will have significant adverse impacts on:

1. Wetlands. OAR 340-54-050(5)(a)(C)(i).

2. Threatened and endangered species and their habitats. OAR 340-54-050(5)(a)(C)(iii).

3. Sensitive environmental areas including areas of recognized agricultural value. OAR 340-54-050(5)(a)(C)(iv).

D. The project is highly controversial. OAR 340-54-050(5)(a)(F).

For the above reasons and because the proposed project will affect land with unique characteristics, involve significant uncertain and unknown risks, is likely to adversely affect several special status species and anticipates use of water in violation of state law, the department should conclude that the proposed action has the potential to significantly affect the quality of the human environment. For those same reasons, the department should deny approval or funding for the project as proposed.

Louie Kazemier

Dean Freeborn

Mark Knaupp

Claude White

Brian Hewitt

Glen Stoller

December 7, 1994

TO: Jaine Isaza
Project Officer
Western Regional Water Quality Division
Department of Environmental Quality
1102 Lincoln Street
Suite 210
Eugene, Oregon 97401

FROM: Ron Marx
4905 Livermore Road
Dallas, Oregon 97338

RE: Rickreall Creek - Polk County

I farm land east of Rickreall on Morrow Road. I irrigate out of the Rickreall Creek. Crops that have been grown on this farm and irrigated from the Rickreall Creek are bush beans, corn, sugar beets, clover, alfalfa, radish seed, strawberries, grains and grass seed.

I'm concerned that if Dallas sewer system were to build this pipeline, diverting their effluent into the Willamette River and bypassing the Rickreall Creek that: 1.) I would not have enough water to irrigate my crops and 2.) The quality of water would be less than I now have.

There is some indication that I might be able to use the pipeline water for irrigation, but because the quality of this water is questionable, there appears to be substantial restrictions on the use of this water:

a. Food crops could not be irrigated;

b. Water containment would have to be controlled with no leakage of this water back to any streams or ditches;

c. Costs and other restrictions are really unknown.

It appears to me that real questions arise as to the long term benefit of diverting this water into the Willamette River; thus, reducing the overall quality of the Willamette River. Municipalities along the Willamette River system will be facing this same problem in the future and if everyone decides to solve it this way, the W illamette River quality will eventually be reduced below requirements. Also, reducing the stream flow in the Rickreall Creek would undoubtedly reduce the quality of the remaining water in the Rickreall Creek. The present stream flow needs to be maintained and the best way to do this is to clean up the effluent so it can be put back into the system. This will benefit everyone. Agriculture will benefit and this helps maintain our economic base. The Dallas people will benefit with a cleaner more useable drainage maintaining wildlife habitat and aquatic life.

As the Dallas area continues to grow, the demand on water will also grow. We need more water storage and unlike many areas in the country, we have excellent sites for reservoirs.. I cannot see any negative aspect of building reservoirs. They benefit everything and everyone.

Sincerely,

Ron Marx

Ron Marx

RECEIVED

DECEMBER 15, 1994

My name is Glen Stoller. I am speaking on behalf of Elmer Stoller Farms and myself.

I am here to state our oppostion to the proposed pipeline from the Dallas Municiple Waste Water Treatment Plant to the Willamette River.

We think everyone is in favor of cleaning up the creek. But we also think the pipeline is a short-term fix to a long-term problem.

If the water is not clean enough to stay in the Rickreall Creek, we feel action should be taken to clean it up. Changing the "dump"site does not bring a solution. The waste is still there. The recycling and reuse of water is a very important asset to the Willamette Valley and to Polk County.

The meetings that I have attended, have basically stated that the water in the pipeline cannot be used for food crops. The regulations of the pipeline water states that you cannot have any standing water, run off, or livestock at the time of irrigating with pipeline water and you must have signs posted. In this area, that is virtually impossible due to the absorbency of the soil.

The impact of this pipeline to our farming will be greatly affected. We could no longer grow strawberries or corn using this water. Because of crop rotation in farming, any use of this polluted water, could hinder us in rotating and the use of our land, due to certain metals being retained in the soil from this water. Irrigating with pipeline water would also put us at an unfair and dangerous risk of contracting illnesses and diseases linked to human fecal matter and other substances contained in the water. Our children would also be put in an unfair and dangerous home-land enviroment. The proposed pipeline will effect our drainage lines, by cutting thru them, blocking them and disrupting the grades of the drainage lines in many locations. Pipeline regulations state fields would not be able to have drainage systems. From CH2M Hill's studies, they are leading us to believe we will be able to irrigate, but the regulations will make it impossible to do so legally.

CLEAN and SAFE water is good for EVERYONE. That is the solution.

It makes no sense to dry up a perfectly good creek, that has many uses, and STILL send the same polluted water to another river that also has many purposes and uses. Would you take your family for a fun day on the Willamette River if this goes thru? Would you and your children come and stroll thru our irrigated fields with us?

EVERYONE needs to be protected. Not just the City of Dallas, by deverting their waste to someone else.

Respectfully,

Glen Stoller
Elmer Stoller Farms

RECEIVED
DEC 15 1994

December 15, 1994

Jaime Isaza
Department of Environmental Quality
1102 Lincoln Street #210
Eugene, Oregon 97401

Dear Mr. Isaza,

This is in response to Department of Environmental Quality's findings of no significant impact on the construction of the City of Dallas's effluent pipe line to the Willamette River.

In regards to the findings of no significant impact, on the property, water rights on the Rickreall Creek and the environment, I wish to respond.

First, The Property.

The land involved in this issue is prime farm land that for over a century has produced food crops for human consumption. This includes: fruits (apples, cherries, grapes, peaches, pears, plums and strawberries), vegetables (asparagus, beans, beets, cabbage, cauliflower, cantaloupe, carrots, corn, cucumbers, peppers, potatoes, pumpkin, squash, tomatoes, and watermelon), grain crops (wheat, oats, barley, and rye), plus hay and pasture lands, for many a dairy, beef, sheep, hog, turkey and chicken operation.

The land from the first farmer in the valley has been upgraded and improved by knowledge and experience for the betterment of mankind. Irrigation lines were installed to help make the land more productive and produce higher quality crops. Drain ditches and tile were installed so that stagnant water would drain from the lower ground, making it more productive. This drainage system also allowed flood water and excess irrigation water to flow back to the Rickreall Creek, where it could be used by others down stream, if needed.

Second, Water Rights

I am directly affected by this issue. My grandfather worked with others to develop an irrigation system on the Rickreall Creek, which in turn, enabled him, them and many others to use of excess water from the Rickreall Creek to irrigate the land, thereby making the land more productive and improving the area.

Third, the Environment

By allowing the City of Dallas to divert the water from the Rickreall Creek and pump the effluent to the Willamette River, we have taken needed water from the creek. Water that would normally, by water rights, be used to irrigate the farmland. Inadvertently reducing the level of water would also destroy the livability of Rickreall Creek and what wild life exists in and about the area. Lower water levels will raise the temperature of the water, killing some species, and resulting in algae and stagnant water.

Yes effluent is to be available to be used in place of irrigation water. By the statement of the DEQ this effluent will contain to high of a particulate count (or in simple terms be too contaminated) to be used for irrigation on the crops currently produced on land irrigated by water from the Rickreall Creek. We would as farmers no longer be able to produce the crops we now grow. As these crops could not longer be sold or used for human consumption, due to the contamination.

In short, what you are proceeding to implement will destroy the lives of those who toil on the farms and dairies to produce with pride the food and crops that we all enjoy. The livability of the creek will be gone.

You have stated that there is no significant impact on this project, I in turn say that there is.

More time is needed to seriously study the options available. Such as more water storage, a better sewage treatment system, more water available for agriculture, and better water quality for fish and wildlife in the creek.

As a very concerned citizen of this area, I feel that a moratorium needs to be implemented on the construction of new housing in the City of Dallas, until a long term solution for the sewage treatment problem can be resolved.

Sincerely,

Greg Jenkins

RECEIVED
DEC 15 1994

GLEN A. SCATTERDAY
1747 S.W. WOODRIDGE COURT
DALLAS, OREGON 97338
(503) 623 5065

December 15, 1994

Mr. Chair:

My name is Glen A. Scatterday. I live at 1747 S.W. Woodridge Court in Dallas, Oregon.

I chair the Polk County Water Advisory Board and sit on the City of Dallas Water Utilities Advisory Board. Today, I speak for myself only and not for either of the advisory boards mentioned.

I have studied Dallas' Waste water Facility Plan and the Environmental Assessment under discussion. I am also aware of the alternative options that were investigated and evaluated for feasibility and cost, including increased fresh water storage, waste water ponding, increased purification, recirculation etc. Roger Jordon, Dave Shea, the city staff and their consultants, CH2M Hill, should be congratulated for developing a workable plan that (1) complies with the law, (2) meets all current environmental regulations, (3) is the lowest cost of the options available, and (4) retains access to treated waste water by downstream irrigators.

The cost of implementing this plan, the lowest cost option, is over $16,000 for every man, woman and child in the City of Dallas. That is a terrible financial burden. It's hard to argue that we shouldn't have to clean up our environment. We must. The Federal Clean Water Act mandates stringent requirements without funding assistance for small cities. We are not alone. Hundreds of cities across the country and in Oregon face the same kind of financial burden. Our situation is made more difficult and much more expensive by an arbitrary and dubious decision by Oregon Fish & Wildlife to classify Rickreall Creek as a salmonid-rearing stream. Couple that with vigorous enforcement by the Oregon Department of Environmental Quality (DEQ) that demands solutions within very narrow time-frames and without regard to conflicting regulations and the adverse impact on the community as a whole. This is a classic example of government out of control. I don't believe that the framers of the Clean Water Act envisioned the arbitrary and contentious enforcement that we are experiencing.

However, the City of Dallas Waste water facility plan demonstrates once again that the citizens of Dallas are willing to meet their responsibilities to the community and the environment. It does comply with the law, meet regulatory requirements and the city has agreed up front do anything reasonable to accommodate our neighbors downstream. Dallas is acting responsibly and in good faith while responding to bad federal legislation and mindless enforcement.

Mr. Chair, within this "Alice in Wonderland" context, I favor the Dallas Waste Water Facility Plan and agree with the environmental assessment. I congratulate those who developed the plan.

Sincerely,

Glen A. Scatterday

RECEIVED
DEC 15 1994

December 6, 1994

Jamie Ifaza, Project Officer
Western Regional Water Quality Division
D.E.Q.
1102 Lincoln Street #210
Eugene, OR 97401

Dear Mr. Ifaza:

Please accept my apologies if I misspelled your name. I attempted to take addressing information by telephone and I am partially deaf and frequently confuse a message.

My intent with this letter is to address the plan proposed by the City of Dallas for disposing of sewage. Enclosed is a "letter to the editor" that I've mailed to the local newspaper. All media have been very quiet about the proposed plan. Very few citizens have any notion about what has been proposed. With so little attention given to publicizing the problem it is not likely that the D.E.Q. can obtain an accurate impression of how much opposition there would/will be to the plan once revealed to citizens in the Willamette Valley.

First of all, regardless of what has been suggested, the plan to dump sewage, thinned with water from Rickreall Creek, directly into the Willamette River, threatens the ecology of both drainage systems. Second, the pipeline proposed is at best a temporary solution which, given that the growth of Dallas seems inevitable, may last no more than a decade. Third, the technology exists to install a sewage treatment and processing procedure that will reduce the threat to the ecology of the Willamette Valley. Fourth, given that the cost of the temporary solution will be added ultimately to the cost of a more permanent solution which will be required later at a greater cost than if constructed now, it seems injudicious to not move as quickly as possible in implementing the best technology.

Too, in spite of ample warning, Dallas has indicated a reluctance to implement any plan:

> In October, 1970, CH2M developed for the City of Dallas a *Sanitary Sewer Plan for the Dallas Urbanizing Area.*
>
> In May, 1980, CH2M developed for the City of Dallas a *Wastewater Facility Plan.*
>
> In February, 1991, CH2M developed for the City of Dallas a *Sewer System Evaluation Survey.*
>
> The City of Dallas has had a *Comprehensive Plan* since December, 1987.
>
> On 12-19-91, the City of Dallas received a "Notice of

Noncompliance" from the Department of Environmental Quality indicating that Rickreall Creek would be placed on the *Federal Register* as a water quality limited stream during summer months.

In September, 1993, CH2M developed a *Draft Wastewater Facility Plan* for the City of Dallas because: 1) Dallas was not in conformance with the State and federal water quality criteria and 2) of wet weather bypassing of the current sewage treatment facility, bypassing which violated federal minimum secondary treatment standards.

In addition there have been at least two "agreements" between the City of Dallas and the DEQ. Both the DEQ and Dallas have stated they recognize that until new or modified facilities are constructed and put into full operation, Dallas will continue at times to violate permit effluent limitations and water quality standards in Rickreall Creek.

In brief I contend that there is little reason to place any confidence in either the City of Dallas or the DEQ. Both seem persuaded that avoiding the issue is the best means of coping with it. There is currently no evidence that either the City of Dallas or the DEQ have any intention of behaving responsibly.

Sincerely yours,

Gerald Gage

Gerald Gage
8550 Rickreall Road
Rickreall, OR 97371
(503) 623-6708

December 6, 1994

Letters to the Editor
ITEMIZER OBSERVER
Box 108
Dallas, OR 97338

Citizens of Dallas,

My assumption is that citizens of Dallas would not deliberately choose to destroy the ecology along two streams in the Willamette Valley, however, it appears that you are proceeding, however unknowingly, to do just that. Plans are to construct a line of pipe from Dallas to the Willamette River. This pipe will carry sewage, mixed with water from Rickreall Creek, directly into the Willamette River. The Rickreall Creek system is threatened because of reduced flows of water. The Willamette system is threatened because of sewage contamination.

The technology exists to manage sewage so that the viability of natural water systems is not damaged. Using that technology will actually result in a system lasting seventy-five years or more and at a cost that will be far less over time than implementing the measure currently proposed. The proposed pipeline is at best a temporary solution, a dangerous solution, and an expensive one.

Please attend public hearings with the Department of Environmental Quality at the Court House, 7:00 p.m., December 15th. Consider carefully your involvement in this expensive and unnecessary threat to the ecology of the Willamette Valley.

Sincerely yours,

Gerald Gage
8550 Rickreall Road
Rickreall, OR 97371
623-6708

Ken Hale
16300 W. Ellendale Rd.
Dallas, OR 97338
December 6, 1994

Jaime Isaza
Project Officer
Western Region Water Quality Division
Department of Environmental Quality
1102 Lincoln St., Suite 210
Eugene, OR 97401

Dear Jaime Isaza,

This concerns the environmental assessment of the impacts of the proposed plan by the city of Dallas to pipe treated effluent to the Willamette River. I feel the plan does have environmental impacts and that a finding of no significant impacts is not correct.

I live on a property bordering Rickreall Creek above Dallas (for past 5 years). I am concerned about the long term health of the creek and the people, plants and animals that depend upon and enjoy Rickreall Creek. I have college degrees in agriculture and wildlife managment and am employed as a professional resource conservationist.

During low flow summer months, when the effluent will not be returned to Rickreall Creek, the temperature of Rickreall Creek is bound to rise as the water in the creek will be significantly reduced. Any aquatic animals, birds, other animals and plants that depend upon the current summer flow will be negatively impacted by the reduced water flow.

It will also affect the aesthetics of the lower Rickreall during these summer months. The stream currently has a low flow during the summer, but this low flow will be markedly reduced by the removal of the treated effluent from the stream.

Any irrigation from the creek below the reservoir will be virtually eliminated. Many of the agricultural soils in this area are listed as prime agricultural soils or soils of statewide importance by the USDA Natural Resources Conservation Service. Their current use for irrigated agriculture and their future potential use for specialty irrigated agriculture is important to the economy of Polk County and to the health of the population who consume those agricultural products.

Rickreall Creek is a resource that affects many people in and outside of Polk County. As I understand it, the city was the main source of point source pollution of the creek and was targeted by DEQ when Rickreall Creek was listed as a water quality limited stream. Therefore, the city of Dallas had to develop a plan, (basically in isolation from the other stakeholders in and outside of the watershed) to remedy their contribution to the water quality problems in the creek. With a deadline looming over them, they developed a plan they felt they could afford. However, the proposed plan will **not make Rickreall Creek a healthy stream in the summer.**

It will also not provide a long term solution for Dallas. I assume that one day we will reach the limits of what the Willamette River can dilute and once again have water quality problems in the Willamette. Then cities such as Dallas will need to further treat their water to improve the water quality of the Willamette. Therefore, this solution does have a long term environmental impact on the Willamette River.

Watershed planning is becoming a method of managing watersheds in Oregon and the nation. Rickreall Creek is a watershed that is affected by and affects many people and natural resources in Polk County and the lower Willamette River. Is it not in the best interests of the resource and the people (both now and in the future) to step back from the current push towards a hasty solution and develop a solution to the water quality problem in Rickreall Creek using a watershed approach? This would actively involve all stakeholders in the watershed.

There is a process currently being developed in Polk County to form watershed councils. The state of Oregon (as well as federal agencies) is actively encouraging the watershed health approach. The local steering group of this process includes many of the stakeholders of the Rickreall watershed (City of Dallas, Polk County and the Polk Soil and Water Conservation District). This could be a great opportunity for the state (and DEQ) to encourage the people (citizens, local, state and federal agencies) to use a watershed management process to develop an integrated solution to the water quality problem in Rickreall Creek that **could actually result in a Rickreall Creek that was improved for people, for wildlife and for fish.**

Is it not worth a delay of 1-3 years to develop a plan to address the Dallas city effluent as part of an integrated watershed plan that serves people and natural resources and improves the health of Rickreall Creek?

I encourage the DEQ to not accept the report's finding of no significant impact of the City of Dallas plan to pipe treated effluent to the Willamette River. This plan obviously has impacts to water quality in Rickreall Creek and the Willamette River, to the aesthetics of the Creek, to fish, wildlife and plants using summer flows of the creek and to irrigated agriculture depending on summer flows in the creek.

Sincerely,

Ken W Hale

Ken W. Hale

14010 SE 134th Street
Renton, Washington 98056

(503) 623-6723
(206) 271-4084
(800) 484-1081
tone 8653

DALLAS WAREHOUSE

Rickreall *639,000 BUSHEL CAPACITY* Dallas

1055 South Pacific Highway 1055 Jefferson St

Statement of Al Dembowski

An enviornment impact statement will address all considerations.

A short term proposal would be a mistake. The final proposal should provide for at least the next 100 years.

I hope the city has sought and followed the advice of Aaron Mercer in its forward planning. If they have not, strongly suggest they do so.

Al Dembowski

Al Dembowski, Owner

c: to Itemizer-Observer

For I-O

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City of Dallas - Office of the City Manager

December 15, 1994

Jaime Isaza, Project Officer
Western Region Water Quality Division
Department of Environmental Quality
1102 Lincoln Street, Suite 210
Eugene, OR 97401

Dear Mr. Isaza:

On behalf of the City of Dallas, I would like to encourage the Department of Environmental Quality to approve the Environmental Assessment final conclusion that the City of Dallas wastewater project will have "No Significant Environmental Impact". Dallas has been working for nearly two years in an attempt to find a solution to the problem of bringing the Dallas wastewater treatment system into compliance with the new environmental standards. During that time, all alternatives were investigated and the proposed project was the best alternative identified.

While our City does not agree with the law and rules which are applied to Rickreall Creek and which are forcing our discharge out of Rickreall Creek, we believe the proposed plan is the only responsible plan identified which complies with all the standards and regulations.

Therefore, we respectfully request approval of the Finding of No Significant Environmental Impact for the City of Dallas' proposed project.

Very truly yours,

Roger Jordan
City Manager

RJ:meh

(eys)<mhcor>DEQHrg

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DEC ~~14~~ 15 1994

Oregon

DIVISION OF STATE LANDS

STATE LAND BOARD

BARBARA ROBERTS
Governor

PHIL KEISLING
Secretary of State

JIM HILL
State Treasurer

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November 15, 1994

Jaime Isaza
Western Region Water Quality Division
Environmental Quality
1102 Lincoln Street
Eugene, OR 97401

RE: **Wastewater Treatment Facilities/Willamette River SRF Project C-412611-93**

Dear Jaime:

I have received and reviewed a copy of an application for a wastewater treament facilitiies in Polk County. This project may involve lands or interests managed or regulated by the Division of State Lands (Willamette River). We will need more details of the plans before making any further determinations.

If a review of the Nationwide Wetlands Inventory finds the plan includes wetland areas, under the Oregon Removal-Fill Law (ORS 196.800 - 196.990), removal, filling, or alteration of 50 cubic yards or more of material within the bed or banks of the waters of this state requires a permit from the Division of State Lands. Waters of the state include the Pacific Ocean, rivers, lakes, most ponds and wetlands, and other natural water bodies.

Pursuant to ORS 273.225 - 273.241, 274.525-274.590, and OAR 141-14-070, 141-14-020, the applicant will need to obtain a royalty lease or license from the Division prior to removing any material from Division-owned lands within the plan or project area.

If the proposed plan/project affects land owned or regulated by the Division, according to ORS 274, the applicant must have an easement or license for the use of these lands.

775 Summer Street NE
Salem, OR 97310-1337
(503) 378-3805
FAX (503) 378-4844

Thank you for the opportunity to comment. A copy of the plan and this response has been forwarded to Bill Parks, Resource Coordinator. For further information and assistance, please contact Bill at the Salem Office, 775 Summer St. NE, Salem, OR 97310, or by calling 378-3805 ext. 234.

Sincerely,

Shannon K Relaford
Planning and Policy Section

cc: John Lilly
Steve Purchase
Bill Parks
City of Dallas

Oregon

DEPARTMENT OF ENVIRONMENTAL QUALITY

Western Region

03-24-95P04:30 RCVD

Date: March 23, 1995

To: All Interested Parties

From: Jaime Isaza, Project Officer

Subject: Response to Comments on the proposed Finding of No-Significant Impact (FONSI) for the proposed Dallas Wastewater Treatment Facilities

Attached, please find a copy of the Department of Environmental Quality's (DEQ) response to comments on the proposed FONSI for the Dallas Wastewater Treatment Facilities received during the Public Hearing that was held last December 15, 1994. A total of 18 people presented oral testimony and 10 individuals submitted written testimony.

The attached document summarizes the issues that were raised at the hearing followed by the Department's response. The issue of water rights which was raised by Mr. Joseph Hobson, who represents some of the farmers, has not been addressed here. Because of its nature and legal issues involved, it has been referred to the office of the Attorney General (AG). At this time the Department is awaiting an opinion from the AG.

The Oregon Department of Fish and Wildlife (ODFW) sent a letter to the DEQ on February 27, 1995, which changes the designation of the lower Rickreall Creek from Salmonid spawning to Salmonid passage. Under DEQ rules, this means that a less stringent dissolved oxygen standard will be applied to the lower Rickreall Creek. DEQ has advised the City of Dallas of this change, and the City will be re-evaluating what their low cost, environmentally sound alternatives are with these less stringent water quality standards.

Based on the information received during the public comment and hearing process, and based on the possibility of new treatment and discharge alternatives, DEQ will not be issuing a FONSI for the original environmental assessment done by the City under DEQ direction. DEQ believes that some areas of the original environmental assessment need additional documentation. In addition, the new alternatives (if any) will need to be evaluated as to their environmental impact.

After the revised environmental assessment is received and reviewed by the Department, we will either propose another FONSI or require that an Environmental Impact Statement be prepared. Prior to issuing a FONSI, the Department will again seek public comment.

Attachments: Responses to Comments
Public Hearing Summary

John A. Kitzhaber
Governor

1102 Lincoln
Suite 210
Eugene, OR 97401
(503) 686-7838

RESPONSES TO COMMENTS

Below are summaries or paraphrases of the comments received and the Department's responses. In some instances, the comments of more than one person have been integrated to produce a summary comment.

1. **Comment:** Removal of effluent from Rickreall Creek will result in higher stream temperatures during low flow summer periods.

   Response: Based on the results of computer model analyses, the Department disagrees with this statement. The effluent is warmer than the stream, and tends to raise the stream temperature. This effect is more pronounced when stream flows are low. The Department does not expect that removal of the effluent will cause the creek to become warmer.

   Below is some pertinent data.

DALLAS - Rickreall Creek Average Water Temperatures (°F)[a]			
Month (1993)	Upstream	Effluent	Downstream[b]
January	43.7	56.0	43.9
February	39.2	54.5	39.6
March	45.4	56.6	45.6
April	48.8	59.9	49.0
May	57.2	64.3	55.4
June	59.0	67.6	59.3
July	65.9	67.2	66.1
August	62.6	70.3	64.8
September	60.5	68.9	63.0
October	49.9	62.7	53.3
November	47.3	59.3	47.5
December	44.0	54.5	45.2

[a] Source: Dallas WWTP, 11/1/94.
[b] Calculated temperatures

2. Comment: Removal of a large quantity of water from the sub-basin (i.e., by virtue of shifting the effluent discharge location to the Willamette River) will affect the water table.

Response: There should be no detectable impact on the level or quality of deep aquifers. There is a potential for minor local impacts to shallow aquifers based on the irrigation or lack of irrigation of reclaimed water. Precipitation has the single largest influence on the level of water tables. The Rickreall subbasin contains 94.4 square miles. Basin wide, the average annual precipitation is 65.3 inches. Therefore, the subbasin receives about 14.3 billion cubic feet of precipitation each year that either runs off or recharges the groundwater. At the future design flow (year 2015), the plant will treat approximately 0.174 billion cubic feet or just over 1 percent of the entire water volume available within the subbasin.

Currently, the treated wastewater is discharged to the creek and later withdrawn for irrigation. If the reclaimed water continues to be irrigated within the subbasin, there should be no net impact to the water table overall. If the future irrigation sites are different from the current irrigation sites, there may be minor local differences on the water table level.

3. Comment: Removal of the effluent from Rickreall Creek will eliminate irrigation; farmers will be left without adequate irrigation water. Presently, irrigated water returns to the creek via tiles drains and ditches. Removal of the effluent from the sub-basin will disrupt this replenishment system and have an ill-affect on farming.

Response: Although the Environmental Assessment acknowledges that removal of the City's effluent from Rickreall Creek may affect the exercise of water rights downstream of the existing outfall, the issue was not examined in detail. In view of the widespread concern that was expressed on this matter at the Public Hearing, the Department believes that a more detailed analysis that more fully discloses the potential impact of effluent removal on irrigation with creek water is warranted. The Department has determined that supplemental environmental analysis on this subject should be prepared.

4. Comment: Loss of water from return flow will affect wetland and stream habitat of special status species.

Response: The Department acknowledges that wetlands and stream habitat may potentially be impacted by effluent withdrawal from Rickreall Creek. However, based on the information available at this time, it is not possible to determine whether any impacts will occur or if there are any special status species and/or habitat present in the project's area. Additional information is required to fully assess potential impacts and the presence of special status species and/or habitat.

5. Comment: The effluent outfall pipeline will disrupt the tile drainage system that carries excess water away from the land during wet times of year and will thereby diminish the prime agricultural character of the land.

   Response: This issue was not addressed in the Environmental Assessment. The Department believes this is an important subject and has concluded that supplemental environmental analysis should be prepared. The analysis should attempt to determine the extent to which the outfall pipeline may disrupt the drainage system, and to identify at the conceptual level the design features and construction methods that would avoid or minimize disruption.

6. Comment: The proposal violates the Polk County Comprehensive Plan and State Planning Goal 3.

   Response: The current treatment plant site and the additional land necessary for the expansion is already zoned appropriately as a public facility. In order for the Department to approve plans and specifications for a discharge pipe to the Willamette River, a Land Use Compatibility Statement (LUCS) signed by Polk County would be required. Polk County would have to issue a conditional use permit (as a utility facility necessary for public service) to the City for the pipeline land prior to signing the LUCS.

   The proposed facilities will not change the Exclusive Farm Use designation for any other land. No land would be rezoned and an exception to Statewide Planning Goal 3 would not be required.

7. Comment: The impact of effluent withdrawal on downstream water users is a Significant Impact.

   Response: The Department does not believe that information developed thus far supports the statement. The supplemental analysis noted in Item 3 above should provide the basis for determining the significance of effluent removal on water users.

8. Comment: As per the State Water Resources Statutes, discharge of the effluent to the Willamette River does not constitute a beneficial use and therefore any effluent not used for irrigation must be returned to Rickreall Creek at the point of withdrawal to be available to downstream users. ORS 537.132 does not negate this requirement.

Response: The Department has referred this issue to the Oregon Department of Justice for analysis.

9. Comment: The suitability of effluent for irrigation and the consequences of its use on agricultural practices and the land itself are unclear. The use of effluent will result in a metals build-up in the soil.

Response: There are numerous facilities throughout Oregon and many other states that have utilized reclaimed wastewater for agricultural purposes without adverse consequences to the land or public health. The practice is considered beneficial and desirable to many farmers since the use of reclaimed wastewater conserves other water supplies, provides nutrients, saves energy and prevents water pollution.

The Oregon Rule is based on California Title 22 Rules. Prior to promulgation, California completed a comprehensive assessment of public health risks and ecological impacts including consequences on agricultural practices and the land (i.e., salt and metals build up). Oregon's Rules are consistent with EPA's Manual of Guidelines for Water Reuse (EPA/65/92004).

In this instance, the degree of treatment provided by the City of Dallas in order to comply with water quality based discharge standards will coincidentally protect all users of the reclaimed water.

10. Comment: The use of effluent for irrigation would impose restrictions and requirements on farming practices and the kinds of crops grown. It is unclear if farming with effluent will be feasible.

Response: It is true that some restrictions will be imposed. The Rules governing the use of treated wastewater for irrigation specify the types of crops that may be grown and the application restrictions depending on the degree of disinfection the effluent has received. The purpose of these rules is to protect public health and groundwater. In the specific case of Dallas, the effluent that would be produced by the facilities proposed in the Wastewater Facilities Plan could not be used on food crops intended for direct human consumption without processing (cooking). Additionally, each irrigator will have to negotiate a contractual arrangement with the

City for delivery of the effluent from the pipeline.

Irrigation of reclaimed water is currently permitted throughout the State of Oregon and it is been used by over fifty communities.

11. Comment: Discharging effluent to the Willamette River will reduce its water quality.

Response: As part of the development of the Wastewater Facilities Plan, the Department conducted a computer model analysis of the projected 20 year (Year 2015) discharge to the Willamette River. The analysis concluded that the discharge would not result in violation of water quality standards and will not have a significant impact on water quality. Therefore, the Department considers the proposed Willamette River discharge acceptable and is prepared to undertake the process leading to the issuance of a new Wastewater Discharge Permit for it.

Of course, the Department prefers that where ever feasible effluent be disposed of without discharge to surface waters. Thus, the Department supports the "on-demand" irrigation concept proposed in the Facilities Plan. The Department is hopeful that as much effluent as possible will be used for irrigation and not reach the river.

12. Comment: The best solution to solving the problems with Dallas' wastewater is to give it proper treatment so it can be discharged to Rickreall Creek as it presently is.

Response: In the Fall of 1992 while the Department was developing a revised Wastewater Discharge Permit for the Dallas Wastewater Treatment Plant, the Oregon Department of Fish and Wildlife (ODF&W) provided DEQ with a letter which characterized Rickreall Creek as "..spawning, rearing and migration habitat for these salmon, trout and steelhead." The designation of the stream by ODF&W as "Salmonid fish producing waters" requires that DEQ ensure that a very stringent Water Quality Standard for Dissolved Oxygen be met. [OAR 340-41-445(2)(a)(E)]

DEQ conducted a computer model analysis to determine under what stream flow conditions Dallas could discharge to Rickreall Creek without the effluent causing a violation of the applicable Dissolved Oxygen Standard. The analysis assumed a very well treated, high quality effluent.

The Department concluded that when stream flows are below 90 Cubic Feet per Second (CFS) during the summer discharge period (May through October) and below 45 CFS during the regulatory winter (November through April), any effluent discharge would cause a violation of the Dissolved Oxygen Standard. These stream flow based discharge limitations are incorporated into the City's Discharge Permit. Since stream flow is typically below 90 CFS in the summer and is sometimes below 45 CFS in the winter (especially November and April) the City is effectively precluded from discharge at these times.

The Department considers these discharge limitations to be necessary to meet the water quality protection requirements of federal and state laws and regulations.

So long as Rickreall Creek downstream of the treatment plant outfall is classified as salmonid producing, the Department perceives no practical, dependable, reasonably cost-effective way for treated wastewater to be discharged to Rickreall Creek during the irrigation season except during unusually high flow conditions.

13. Comment: More water storage is needed.

    Response: The City of Dallas, in conjunction with Polk County, is presently conducting a study to explore the possibility of increasing the storage capacity of Mercer reservoir or to build an additional one which would replenish and increase water flows to Rickreall Creek. This study focus on the City's needs and those of the agricultural community. Completion of the study is expected by the end of the summer (1995). It should be noted however, that the Department does not have statutory authority over water storage and impoundment issues which fall under the authority of the Oregon Water Resources Department.

14. Comment: The problems of Rickreall Creek should be addressed on a comprehensive watershed basis.

    Response: Dissolved oxygen and nutrients have been identified as problems directly associated with the Dallas WWTP discharge into Rickreall Creek. These problems have been addressed by establishing a total maximum daily load (TMDL) and wasteload allocations. It is anticipated that controlling this source (the only point source in the stream) will result in eliminating the observed violations of the dissolved oxygen standard and is a necessary part of the pollution control strategy for the stream.

15. Comment: There should be a moratorium on new housing construction in Dallas until the wastewater treatment situation has a long-term solution.

Response: In June, 1992 Dallas and the Department entered into an enforceable legal agreement called a Stipulation and Final Order that requires the City to take the steps needed to provide adequate new wastewater treatment facilities on a specified schedule. The City has met the requirements of the Order to date. The Department considers the completion of the Facilities Plan which proposes a long term solution to be a major step forward. Furthermore, most of the problems with the City's existing facilities, particularly bypassing of raw sewage under high flow conditions, results from high quantities of inflow and infiltration, which is likely to only minimally exacerbated by short-term population increases. Consequently, the Department does not believe a moratorium is warranted.

16. Comment: The adverse impact on affected species of reduced flows in Rickreall Creek from the proposed project does constitute a Significant Impact.

    Response: Significant adverse impacts on special status species and/or habitat cannot be determined at this time because their existence in the project area has not been documented. Additional information is required in order to make this determination.

17. Comment: The EA is not an adequate disclosure document of the social and environmental impacts. Major areas of omissions are: analysis of the impact of effluent withdrawal from the creek; graphic representation of wetlands; no T/E species field surveys were conducted.

    Response: The Department acknowledges that additional information is required to determine social and ecological impacts of this project in the area.

Appendix G
DEQ Review Comments and Engineer Response to Comments

Oregon

DEPARTMENT OF FISH AND WILDLIFE

NORTHWEST REGIONAL OFFICE

DEPT OF ENVIRONMENTAL QUALITY
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NORTHWEST REGION

February 12, 1996

Richard J. Santner
Oregon Department of Environmental Quality
Water Quality Source Control Section
Northwest Region
2020 SW Fourth Avenue, Suite 400
Portland, OR 97201-4987

Dear Mr. Santner:

We have reviewed the Oregon Department of Environmental Quality's revised Dissolved Oxygen Criteria (contained in OAK 340-41; adopted January 11, 1996 by the Environmental Quality Commission) to determine the appropriate beneficial use classification for Rickreall Creek from the City of Dallas'wastewater treatment plant outfall to the creek mouth.

The opinion of the Oregon Department of Fish and Wildlife remains that the "cool water aquatic life" beneficial use classification contained in the new standard is appropriate for lower Rickreall Creek.

Thank you for the opportunity to comment.

Sincerely,

Steven R. Mamoyac

Steven R. Mamoyac
District Fish Biologist

bmk

John A. Kitzhaber
Governor

7118 NE Vandenberg Ave.
Corvallis, OR 97330-9446
(503) 757-4186
FAX (503) 757-4252

Oregon

DEPARTMENT OF ENVIRONMENTAL QUALITY

NORTHWEST REGION

January 24, 1994

Mr. Roger Jordan
City Manager
City of Dallas
P.O. Box 67
Dallas, OR 97338

Re: Review of Draft Wastewater Facilities Plan

Dear Mr. Jordan:

On December 8, 1993 at 10:00 at the Department's Portland Headquarters Office, a meeting was held to discuss the Draft Wastewater Facilities Plan prepared on the City's behalf by its consultant, CH2M HILL. The following people participated in the meeting:

City of Dallas:
Roger Jordan, City Manager
Dave Shea, Public Works Director

CH2M HILL:
Mike Duvendack
Mark Lasswell

DEQ:
Jim Sheetz
Jaime Isaza
Mark Hamlin
Sonja Biorn-Hansen
Francis Dzata
Richard Santner

This letter serves to document the issues regarding the Draft Plan raised by the Department during the meeting and to state our understanding of any conclusions that were reached. We have also included some review comments on the Draft Plan that were not specifically discussed at the meeting.

Our comments listed below are generally sequenced to follow the order in which the subject matter appears in the Draft Plan; the sequence does not imply the relative importance of each comment. We have marked with a double asterisk (**) those comments which we perceive as addressing major substantive issues which may materially affect the conclusions or viability of the Plan. The other comments pertain to descriptive or editorial items.

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1. Page ES-2. The last line should properly say "salmonid producing water".

2. Pages ES-3 and 10-5. The present CDBG maximum grant amount should be shown as $750,000.

3.** At several places in Chapters 2, 3, and 5 it is stated that bypasses at the WWTF influent pump station have been measured and included in estimates of present system flows. The Department requested that the text include a brief explanation of how this bypass has been measured, and that the bypass volume also be provided, possibly by inclusion in Table 2-7. It is also indicated that the other bypass (Miller/Fenton) was not monitored. There should be a statement explaining why it was not, and why it was considered unnecessary to have data on the quantity bypassed at this location.

4.** At Pages 2-15 and 2-19, present system daily per capita flow (gpcd) is calculated. Industrial flow is included in the calculation. In Chapter 3, Page 3-5, this gpcd value is used in the projection of future flow based on the assumption that future industrial flow will remain the same proportion of the total flow that it presently is. The Department, based on EPA facility planning guidelines, questioned this assumption in the absence of documentation of future industrial growth. Given the great cost of the proposed facilities and the apparent need for the phased construction of facilities needed to meet all regulatory requirements, the Department is concerned about any planning assumptions that tend to increase the size and cost of the facilities. The Department requested that the assumption on future industrial flow be reexamined.

5.** Tables 3-3 and 3-5 show projected influent flows which, according to the footnotes, do not include I/I removal, except for the WWPHFR column in Table 3-3. Yet Table 6-4 shows 20 year summer/winter design flows, which should presumably include I/I removal, that are the same as the Year 2015 DWADF and WWADF shown in Tables 3-3 and 3-5. The Department requested that this apparent inconsistency be checked and that corrections or clarifying text be provided as appropriate.

6. Page 4-1, second paragraph. The correct terminology is "total maximum daily load".

7. Page 4-2, second paragraph. The sentence that talks about nutrients would state the regulatory case more accurately if it simply said that nutrient concentrations in the creek are considered to be a problem.

8. Page 4-4, first complete paragraph, first sentence. In fact, the flows the Department used in the modelling were 2.0 mgd and

4.5 mgd.

9. Page 4-6, first paragraph. The values presented do not match those in the records of our analysis. What is the source of these?

10.**Page 5-1. The description of the existing collection system should include a table summarizing the design criteria and condition of the four pump stations, including the existence of any hydrogen sulfide corrosion, and any bypass overflow points. Enclosed for your consideration is our current example format for pump station design criteria.

Each of the four discharge manholes should also be inspected by the engineer, with the city's assistance, to evaluate the extent of sulfide corrosion inside the upper manhole cone. Please describe what was used as a probe and report the results. If corrosion is found, the dissolved sulfide level of each pumped discharge should be reported using DEQ's recommended field test procedure (copy enclosed). The Plan should evaluate and recommend corrosion controls as warranted.

11.**Chapter 5. The Department called attention to two planning decisions that pertain to the determination of design flows:

a) At Page 5-12, a peaking factor of 1.7 is selected, while the data in Table 5-6 would support a lower figure.

b) At page 5-18, it is indicated that when the marginal cost between two levels of I/I reduction was small, the lower level was used.

The Department's concern with these two items is the same as that stated in reference to comment Number 4, above: they are conservative planning assumptions which tend to increase the size of the facilities. Cumulatively, these assumptions may result in an oversized facility thereby increasing costs. The Department asked that these assumptions be reevaluated.

12.**Page 5-21. The MMADF value used in the I/I removal cost-effectiveness analysis does not correspond to the value in Tables 3-3 and 3-5. Why?

13. Page 6-1. Water Quality Standards are reviewed every three years.

14.**Page 6-9, first paragraph under "Surface....". The text correctly characterizes the regulatory mass load limitations and potential increase option for summer discharge to the Willamette. However, nowhere in the remainder of the document is it clearly stated whether the Willamette treatment/disposal option, as specified in Chapters 7 and 9, is premised on meeting the existing mass load limits or on securing an increase from the EQC. The proposed course of action should be made clear in the text at appropriate locations.

15.**Page 7-8, third paragraph. In conjunction with this text, and/or at another appropriate location in the document it should be made clear that for the on-demand reuse option to be viable, appropriate institutional arrangements will have to be made with effluent users to assure that the requirements of the Department's reuse rules, as described in Chapter 6, are met. The City's preliminary thinking on the structure of these arrangements could be described.

16.**In none of the Present Worth Cost Comparison of Alternatives that appear in Chapters 7, 8 and 9 is Salvage Value included in the analysis. The Department considers the inclusion of Salvage Value to be standard wastewater planning practice. The Department believes, in the absence of any acceptable justification to the contrary, that the Present Worth Analyses should be revised to include Salvage Value.

17. Tables 7-10 and 7-11 are in reverse sequence.

18.**Chapter 7, various locations. The Department is concerned about the potential for sulfide development in the (outfall) force main. Detailed design data are needed for the selected outfall alternative. The Plan should evaluate the potential for sulfide development in the force main and indicate the sulfide control design measures that will be used to prevent discharge toxicity.

19. Page 10-5. Third bold subject heading should read "...Special <u>Public</u> Works....".

20.**Pages 10-11 to 10-13. The Department indicated that in order to fully evaluate Phase 1 of the proposed phased approach to building the project, the following questions about Phase 1 would have to be answered:

a) Will the facilities have the hydraulic capacity to contain the flows generated by the 5-year winter storm and the 10 year summer storm?

b) Will the facilities be able to meet 85% BOD/TSS removal in summer if not in winter?

c) Will the facilities be able to stay within the existing mass loads in summer and winter?

d) Will the facilities be able to meet the Minimum Design

Criteria for BOD/TSS concentration in summer and in winter?

21.**The Department noted that because it is so difficult to accurately predict the actual flow reduction that will result from an I/I correction program, it is therefore often difficult at the planning stage to accurately project future system flows as a basis for sizing facilities. Thus, there is a certain logic in doing I/I correction first, and then projecting flows and sizing facilities. Of course, this approach is most appropriate in situations where the cost of facilities is more sensitive to the capacity

The Department asked the City to consider if doing I/I correction and other collection system work first, so as to eliminate the uncertainty about the "present flows" component of "future flows", might be appropriate for Dallas. The City indicated it would take at least an initial look at this question. All parties recognized that implementation of this approach would raise technical and regulatory questions that would have to be worked through.

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There was also a brief discussion of the proposed Scope of Work for the Environmental Assessment (EA) for the project. The Department emphasized that the EA should closely follow the format and content of the EPA guidelines and examples of other EAs that had been provided. The Department further indicated that some of the field reconnaissance proposed for the EA might more appropriately be deferred to the design stage of the project.

At the conclusion of the meeting the Department stated that it regarded the Draft Plan as an excellent document, the above comments notwithstanding. The Department indicated that it supported the basic disposal alternative of discharge to the Willamette River because it ended all discharge to Rickreall Creek and provided the opportunity for the reuse of effluent in the summer. The Department stated its commitment to work with the City to resolve the issues raised in this letter and advance the project to the construction stage.

As noted at the meeting, due to Reorganization and Regionalization, your project has been assigned a new DEQ Project Officer, Jaime Isaza (229-6748). From now on he should be your contact person. Of course, I am available to Jaime to fill him in on project history.

If I may be allowed a personal observation, it has been a great personal and professional pleasure to work with you, Mr. Shea and your consultants on this very challenging project. Although the issues have been tough, the interaction has always been cordial and cooperative. I wish you the best success with this important environmental project. Please do not hesitate to contact me at 229-5219 if I can ever be of assistance.

Sincerely,

Richard J. Santner
Water Quality:
Technical Services Section

enclosures

cc w/ enc:
Dave Shea, Dallas
Mike Duvendack, Mark Lasswell, CH2M HILL
cc w/out:
Barbara Burton, Mark Hamlin, Francis Dzata, Jaime Isaza, Sonja Biorn-Hansen, David Mann, James R. Sheetz, DEQ

CH2M HILL
Engineers
Planners
Economists
Scientists

August 15, 1994

OPW33407.B0.11

Oregon Department of Environmental Quality
1102 Lincoln
Suite 210
Eugene, OR 97401

Attention: Jaime Isaza

Dear Jaime:

Subject: Response to Dallas Draft Wastewater Facility Plan Review Comments

This correspondence responds to DEQ review comments contained in Richard Santner's letter to the City of Dallas dated January 24, 1994. Both Mr. Santner's letter and this letter have been included in Appendix G of the Final Wastewater Facility Plan for the City of Dallas. The following responses are numbered to match the numbering of DEQ review comments.

1. This comment has been incorporated.

2. This comment has been incorporated.

3. Additional text which discusses the bypass points and bypass monitoring has been added to Chapter 5 (see page 5-5). Additional text which discusses bypass estimation by City staff has been added to Chapter 2 (see page 2-24). The estimated WWTF bypass volumes from 1989 to 1992 have been included in Table 2-7. No bypass volume data exists for pre-1989 conditions.

   Regarding the bypasses, it is anticipated that if the bypasses at the WWTF influent pump station are eliminated, the bypasses at Miller/Fenton (upgradient of the pump station) will also be eliminated. Additional collection system modelling will be performed during the WWTF design to assure that the collection system can convey all flow during the 5-year winter storm and the 10-year summer storm.

4. The assumption of future per capita industrial flows remaining constant throughout the planning period has not been changed. The City wishes to

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retain the present level of industrial capacity in their wastewater treatment facility for future industrial growth. In addition, reducing the future per capita industrial flow projections would have a very small effect on maximum month and peak hydraulic flowrates which are used to size conveyance and treatment facilities. For example, if future per capita industrial wastewater flowrates were estimated at half the current per capita industrial wastewater flowrate of 35 gallons per capita per day, the difference in year 2015 average base sewage flow rates would be only 0.07 mgd.

5. Tables 3-3 and 3-5 have been modified to reflect a 19 percent reduction in rain-dependent infiltration and inflow (RDI/I) under all flow conditions.

6. This comment has been incorporated.

7. This comment has been incorporated.

8. Per correspondence to CH2M HILL from Sonja Biorn-Hansen dated 5/20/93, the most recent water quality modelling for Rickreall Creek was performed with WWTF flows of 2.3 mgd for DWADF and 4.8 mgd for WWADF.

9. Per correspondence to CH2M HILL from Sonja Biorn-Hansen dated 5/20/93, the most recent water quality modelling for Rickreall Creek was performed with WWTF flows of 2.3 mgd for DWADF and 4.8 mgd for WWADF.

10. Information on the four existing collection system pump stations has been added to Chapter 5 (see Table 5-1).

11. a) The peaking factor ratio [peak instantaneous flow (PIF) to peak day (PDADF)] has been reduced from 1.7 to 1.5 throughout the document.

    b) Based on experience, I/I removal programs have often produced less removal than predicted. Therefore, we believe that a more conservative estimate of I/I removal is appropriate to counteract I/I migration phenomona.

12. The WWMMADF values used in the I/I removal cost-effectiveness analysis <u>do</u> match with those for 1990 found in Tables 3-3 and 3-5.

13. This comment has been incorporated.

14. Mass loads are discussed in Chapter 10, page 10-11.

15. Discussion of institutional arrangements for the on-demand reuse system have been added to Chapter 6, page 6-19.

16. Present worth cost estimates in Chapters 7, 8, and 9 have been revised to include salvage value.

17. This comment has been incorporated.

18. Measures to reduce the sulfide formation potential in the outfall will be included in the design of the new outfall force main. During the predesign, two options will be evaluated to determine the best control measure to prevent hydrogen sulfide formation in the outfall force main. These two options will be effluent aeration at the effluent pump station and air stripping at the outfall structure.

Design criteria for the selected outfall alternative pipeline has been added to Chapter 7, page 7-29. Effluent pump station design criteria is located in Appendix C, page C-22. Outfall structure design criteria will be developed in more detail during the predesign (see Chapter 6, page 6-10 for discussion).

19. This comment has been incorporated.

20. a) Yes. Following Phase 1 implementation, the treatment and conveyance facilities have the hydraulic capacity to contain flows generated by the 5-year winter storm and 10-year summer storm (refer to page 5-10).

b) No. Following Phase 1 implementation, the facilities will be able to meet 85% BOD/TSS removal in summer. However, during Phase 1 the facilities may not be able to meet 85% BOD/TSS removal consistently in winter. Removal of 85% of BOD/TSS will be difficult during high flow months in winter due to dilute influent wastewater. A proposed, tiered percent removal requirement is discussed in Chapter 10, page 10-13.

c) No. Proposed mass loads based on a Willamette River discharge and calculated with basin standard effluent concentrations are proposed as discussed in Chapter 10, page 10-11.

d) Yes. Following Phase 1 implementation, the secondary treatment facilities are expected to meet the Minimum Design Criteria (per OAR, Chapter 340, Division 41) for BOD/TSS concentration in summer (10 mg/L). Also, the facilities are expected to achieve secondary treatment and 30 mg/L BOD/TSS during the winter.

21. An evaluation was made to determine the estimated capital expenditures for an implementation option which would involve doing I/I correction and other collection system work in Phase 1 and WWTF construction in Phase 2. It was estimated that this option would defer $300,000 in costs from Phase 1 to Phase 2 compared to the implementation option in the Facility Plan. However, the accelerated collection system improvements option was not pursued given regulatory complications (including the need to negotitate a new SFO), greater potential for dry weather permit violations (10/10 BOD/TSS) as loadings would increase on existing treatment facilities, and potential for third party lawsuits due

to a delay in construction of treatment facilities.

Sincerely,

CH2M HILL

Michael R. Duvendack

Michael R. Duvendack, P.E.
Project Manager

kes

Attachment: January 24, 1994 Letter to Roger Jordan/City of Dallas
From Richard Santner/DEQ

cc: Roger Jordan/City of Dallas