Forest Meadows Wastewater Facility Plan

September 2004

HDR

Forest Meadows Wastewater Facility Plan

Calaveras County Water District

Prepared under the responsible charge of
Kevin A. Kennedy, P.E.

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We wish to express our appreciation to District Staff for their assistance and many contributions toward the development of the Forest Meadows Wastewater Facility Plan. We look forward to working with the District again on future projects.

ES. Executive Summary

On August 29, 2002, the California Regional Water Quality Control Board (RWQCB) issued a Cleanup and Abatement Order (CAO) R5-2002-0722 to the Calaveras County Water District (District) and the Forest Meadows golf course owners. The CAO ordered the District and golf course owners to provide a timeline for making upgrades to the wastewater treatment facilities to meet the California Department of Health Service's (DHS's) Title 22 requirements.

The purpose of this facility plan report is two-fold:

1. To satisfy the facility planning requirements set forth in the CAO.
2. To present a comprehensive wastewater collection, treatment, storage, and disposal plan for the Forest Meadows Wastewater Treatment and Reclamation Facility.

Current and Projected Flows

Representatives from the local developers, the District, and HDR staff discussed growth within the Forest Meadows community. Currently, the wastewater facilities serve a population equivalent of about 470 equivalent single family units (ESFUs). Based on the projections provided by the developers, it is estimated that a population equivalent of about 1,400 ESFUs will be served at buildout.

A standard rate of 195 gallons per day (gpd) per ESFU was adopted by the District's Board. This rate was used as the basis for developing the projected average dry weather flows (ADWFs) shown in Figure ES-1. To compensate for the trend towards higher wastewater production rates, the current unit flow factor of 110 gpd per ESFU was increased to 195 gpd per ESFU over a twenty-year period.

Regulatory Considerations

The current Waste Discharge Requirements (WDR) is scheduled to expire in fiscal year 2010. The RWQCB and DHS were contacted to discuss potential changes and/or additions the District might expect in the future. A summary of the information collected is presented below:

- At this time, the DHS has no plans to revise or revisit the Title 22 requirements adopted in 2000, which pertain to recycled water standards.
- Groundwater monitoring requirements for the storage reservoir and golf course are likely to be added when the WDRs are renewed.
- Both the WDR and CAO contain several provisions pertaining to the availability of emergency storage, storage pond freeboard, and golf course irrigation practices. Both the RWQCB and DHS will continue to monitor these particular facilities until compliance is demonstrated.

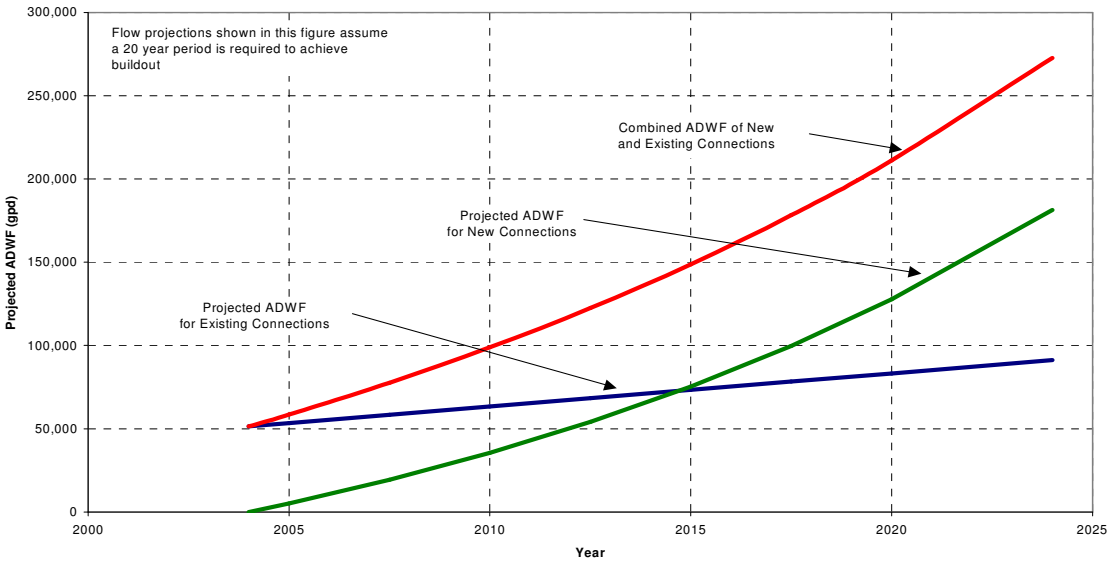

Figure ES-1. Current and Projected Average Dry Weather Flows

In addition, the CAO requires the submittal of specific documents for meeting Title 22 and WDR and sets forth a compliance schedule.

Existing Facilities

Assessments of the existing wastewater collection, treatment, storage, and disposal facilities were conducted to determine their rated capacities and identify specific improvements required to accommodate future flows. Table ES-1 presents a summary of the estimated treatment, storage, and disposal capacities in terms of ESFUs. As shown, both the treatment plant and golf course have capacities that exceeds current conditions based on a rate of 110 gpd per ESFU, whereas the storage pond capacity is not sufficient for existing flows. In the future, as rates increase to 195 gpd per ESFU, the storage and disposal capacities will be exceeded, thus requiring expansion of these facilities.

Table ES-1. Summary of Treatment, Storage, and Disposal Capacities

Facility	Estimated Capacity (ESFU)	
	110 gpd per ESFU	195 gpd per ESFU
Treatment Plant	580	475
Storage Pond	345	195
Golf Course	530	300

The following is a summary of the recommended immediate improvements needed to accommodate the existing 470 ESFUs. The improvements listed below are based on the current rate of 110 gpd per ESFU.

- **Collection System and Lift Stations**
  - No improvements required to accommodate existing connections.
- **Treatment Plant**[1]
  - Install mechanical aerators in the Complete Mix and Settling/Sludge Storage Basins.
  - Install dissolved air flotation units upstream of the tertiary filters for algae removal.
  - Submit a report describing the plant's emergency storage, disposal strategy, and reliability features.[2]
- **Effluent Storage**
  - Provide a total of 64.5 ac-ft of recycled water storage by:
    1. Reducing the pond catchment area from 9.1 to 8.0 acres.
    2. Modifying the pump intake or pond levees to achieve a volume increase of 2.0 ac-ft.

Long-Term Disposal Alternatives

At this time, the community of Forest Meadows does not have sufficient irrigation sites to accommodate the long-term disposal needs projected for buildout. To provide a long-term disposal plan, the following two alternative disposal methods were considered in addition to expanding the existing facilities and continuing land disposal within Forest Meadows.

- Maximize Forest Meadows Golf Course Irrigation and Convey Remaining Raw Wastewater to the Murphys Sanitation District.
- Forest Meadows Golf Course Irrigation Coupled with Wet Season Surface Water Discharge.[3]

Collection, treatment, storage, and disposal improvements required for each alternative were identified along with the estimated project costs. Golf course irrigation coupled with seasonal discharge to the Stanislaus River via the Collierville Tunnel was determined to be the recommended long-term disposal strategy.

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[1] Additional treatment plant capacity is not required to accommodate current conditions. The items listed reflect improvements required for regulatory compliance.

[2] The District has already initiated a project to address this need.

[3] The alternative was subdivided into surface water discharge to (A) Angels Creek, (B) San Domingo Creek, and (C) Stanislaus River via the Collierville Tunnel.

Recommended Improvements

The recommended improvements needed to facilitate this disposal strategy are described below:

- **Phase 1 Improvements:**
  - Interim Connection Limits: Allow a maximum of 20 new ESFUs per year to connect to the existing wastewater facilities for the next two years.
  - Report of Waste Discharge: Gather the effluent and receiving water quality data required to obtain a surface water discharge permit.[4]
  - Complete Collection and Treatment Plant Improvements.

  The total estimated project cost for these improvements is $3,590,000. The Phase 1 improvements should be in service no later than 2006 to accommodate future flows. These improvements are estimated to expand the wastewater systems capacity to 810 ESFUs.

- **Phase 2 Improvements:** Add a third dissolved air flotation thickener and increase the systems capacity to 1,125 ESFUs. The total estimated project cost for this improvement is $295,000. This new unit should be in service by 2014 to accommodate future flows.
- **Phase 3 Improvements:** Converting the secondary treatment process to a high-rate, activated sludge system and increase the system's capacity to 1,400 ESFUs. The total estimated project cost for these improvements is $1,475,000. The improvements should be in service by 2020 to accommodate future flows.

[4] The District has initiated this project.

1. Introduction

On August 29, 2002, the California Regional Water Quality Control Board (RWQCB) issued Cleanup and Abatement Order (CAO) R5-2002-0722 to the Calaveras County Water District (District) and the Forest Meadows golf course owners. The CAO ordered the District and golf course owners to provide a timeline for making upgrades to the wastewater treatment facilities in order to meet the Department of Health Service's Title 22 requirements.

The purpose of this document is two fold. First, it presents a comprehensive wastewater treatment, storage and disposal system facility plan for the Forest Meadows Wastewater Treatment and Reclamation Facility. Second, it satisfies the facility planning requirements set forth in the CAO.

Forest Meadows is a residential golf course community located on Table Mountain Ridge in the Sierra Foothills, approximately two miles north of the town of Murphys, California and on Highway 4. The District owns and operates the wastewater collection, pumping, and treatment facilities that serve Forest Meadows. Wastewater is treated and reused for golf course storage and irrigation.

Both the District and the owners of the golf course are named as joint dischargers for the Waste Discharge Requirement Order (WDR) adopted by the RWQCB. The WDR permits a discharge of up to 190,000 gallons per day (gpd) for dry weather flows and 280,000 gpd for peak wet weather flows. The primary treatment processes within the Forest Meadows Wastewater Treatment and Reclamation Facility consist of a rotary strainer, two wastewater treatment basins (a complete mix and a sludge settling basin), two continuous backwash sand filters, and ultraviolet (UV) disinfection.

The Effluent Storage and Disposal Agreement (Resolution No. 98-40) between the District and the golf course owners allow the District to deliver an average dry weather flow of up to 188,700 gpd of treated effluent. The storage and reuse facilities are owned, operated, and maintained by the golf course owners.

One of the conditions of the CAO requires the District to have a Facilities Engineering Facility Plan Report (Facility Plan) completed by January 30, 2003. According to the RWQCB, the facility plan must do the following:

- Evaluate projected future flows
- Determine limiting treatment, storage, and disposal factors
- Identify treatment plant improvements and schedule for these improvements
- Evaluate beneficial reuse of recycled water and future disposal options

Background

Forest Meadows was designed and developed by the Calaveras Land Company in the late 1960s. The original 197 acre subdivision (Unit 1) included 260 single-family dwellings, three multi-cluster developments, eight commercial and fourteen recreational and utility lots. The County of Calaveras accepted the Unit 1 final map in 1972.

An agreement between the developer and the District for water service was executed in 1970. Originally, the Unit 1 tentative map did not provide a provision for wastewater treatment. However, in the fall of 1970, the Calaveras Department of Plans and Inspections recommended the developer petition the District for wastewater treatment services.

Following the petition, the District and the developer entered into a sewer service facilities agreement and subsequently prescribed wastewater treatment requirements for Unit 1. Plans for the treatment and disposal facilities were approved by the District Board of Directors in 1972, and were later annexed into the District's service area.

The development itself was approved in two stages:

- Stage 1: 150 equivalent single family units (ESFUs)
- Stage 2: 300 ESFUs

Future stages of development were projected through the year 2003, with an ultimate capacity of 1,800 ESFUs.

The maintenance and operation of the Forest Meadows Unit 1 Water Treatment System was transferred to the District in 1975. At the same time, the District entered into an effluent agreement with the Forest Meadows Development Company. The transfer of ownership and acceptance of the Unit 1 water and sewer systems was completed in January 1976.

Development of Unit 2 followed in 1977 and 1978. In 1979 a moratorium was placed on the Forest Meadows sewer system, limiting construction in Forest Meadows to 60 ESFUs. The moratorium was lifted later that same year when the developer fulfilled District requirements, including expansion of the existing leach field and additions of an aerator and effluent pumps.

Unit 2 was accepted by the District in December 1980. Various additions to the system, including Fairway Condominiums, Units 1A through 1G and Unit 4 were completed and transferred prior to 1988.

A shortage of leach field capacity forced the District to instate another sewer moratorium in 1994, limiting the system to 80 new ESFUs. The moratorium was lifted in May 1999, subsequent to the award of a 450 day construction contract for treatment plant modifications.

The major modifications at the Forest Meadows Wastewater Treatment Plant included tertiary filtration improvements and UV disinfection to improve effluent quality and allow effluent

storage in golf course ponds and reclamation by spray irrigation. Construction of the modifications were completed in February 2000 and were brought on–line in September 2000. This treatment plant expansion was designed to serve approximately 1,600 parcels which is equivalent to the number of services in Forest Meadows Subdivision Units 1 through 5 as shown in Figure 1.

The Effluent Storage and Disposal Agreement between the District and golf course owners was passed and adopted by the District Board of Directors on June 10, 1998. The agreement described the requirements associated with operation of the storage facilities and effluent disposal. According to the agreement, the golf course ownership must provide effluent storage capacity for the following winter season by drawing down the reservoir. The maximum draw down requirement is 17.4 feet below the top of the spillway according to the *Murphys Sanitary District Forest Meadows Report* (Weatherby Reynolds Consulting Engineers, October 1994) and the *Red Apple Ranch Preliminary Impacts Report* (Kennedy/Jenks Consultants, August 2001). This maximum draw down level corresponds to an available storage volume of between 55 and 58 ac-ft.

In September 2000, the District submitted the *Forest Meadows Wastewater Treatment and Disposal Facility 20 Day Emergency Storage Evaluation Report* in accordance with Provision G.1 of the WDR. The report evaluated the capacity of the facility's existing leach field and emergency storage pond. The report concluded there was not sufficient storage/disposal capacity to contain the 20 days of effluent flow prescribed in this provision.

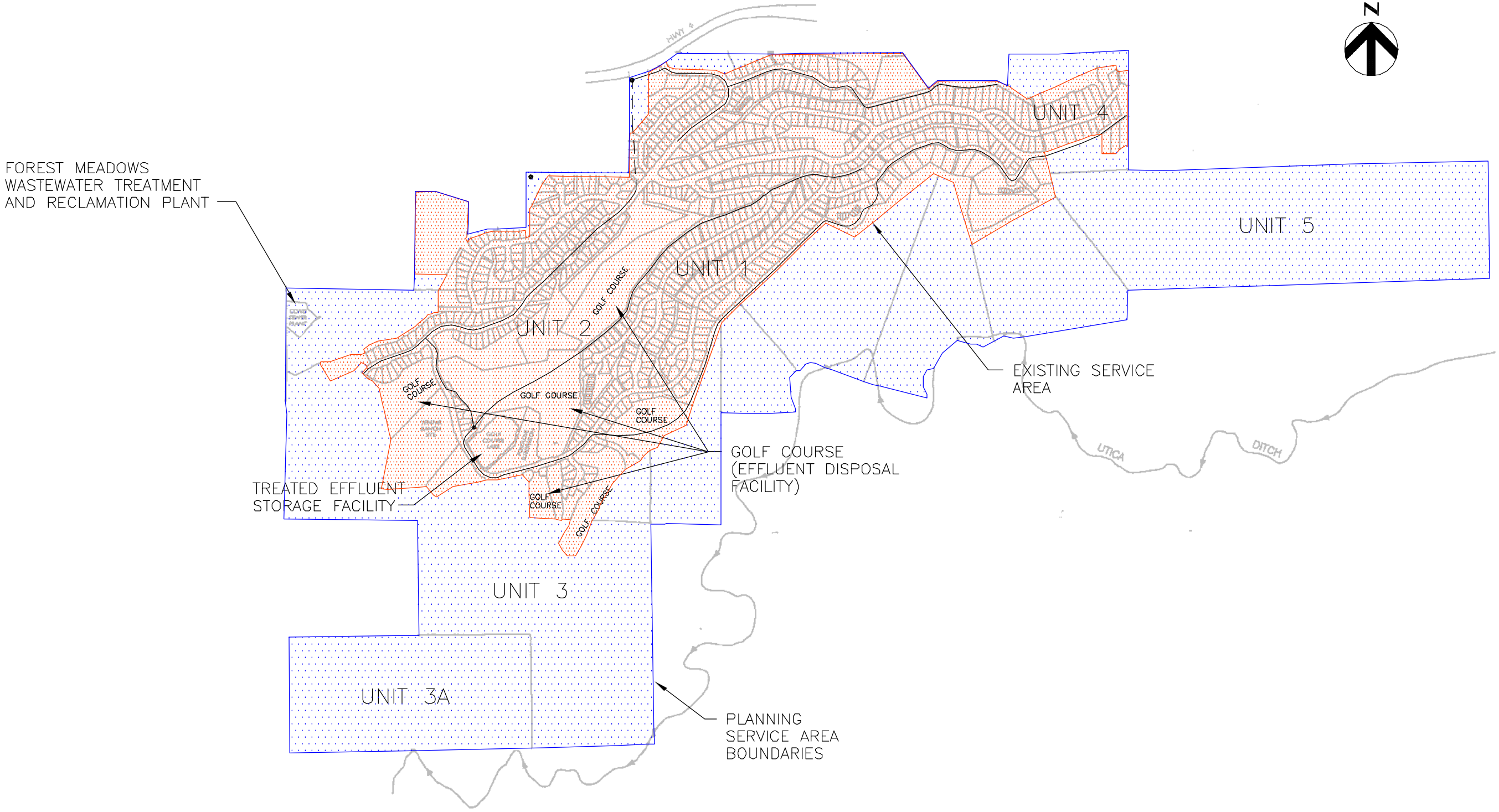
In October 2001 and April 2002, the RWQCB issued Notices of Violation (NOVs) to Forest Meadows for violating the two-foot freeboard requirement in the golf course storage reservoir as prescribed in the WDR. The impacts of these events ultimately resulted in the issuance of the CAO which addresses both the lack of emergency storage capacity and freeboard at the golf course storage reservoir.

Purpose and Specific Objectives

The purpose of this project is to develop a collection, treatment, storage, and disposal facility plan for the District.

In particular, the facility plan provides the following information:

- Delineation of the planning area, considering current commitments and future developments
- Characterization of wastewater flow, including existing and projected average day and peak wet weather flows, and infiltration and inflow (I/I) and incorporation of:



FOREST MEADOWS SERVICE AREA

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Figure 1

- A universal flow factor of 195 gals/ESFU adopted by the District Board for new development
- Increasing unit flow factors from 110 to 195 gals/ESFU for existing connections over a twenty-year period

- Description of existing facilities and capacities
- Evaluation of existing and future options for the collection, treatment, storage, and disposal systems
- Assessment of the wastewater reclamation facilities, including disinfection system, storage, golf course irrigation operations and demands
- Recommended facility improvement plan to serve build-out

This facility plan report presents a summary of the results and findings of the Forest Meadows facility planning project. The facility plan will be used to provide a basis for managed upgrade of the collection, treatment, storage, and disposal systems. In addition, the facility plan can serve as the basis for developing a subsequent financial plan that will fund the construction of the phased capital improvements program (CIP) described at the end of this report.

2. Current and Projected Flow Characterization

An analysis of treatment plant operating data was conducted to characterize historic influent flows. Projected future flows were based on past projected growth within Forest Meadows and the District's standard unit flow rate as described below.

Past and Projected Growth within Forest Meadows

Figure 2 shows the number of ESFUs connected to the treatment facility for the last five years. Within this time period, the average geometric growth rate was two percent per year. The highest rates of growth occurred between 2001 and 2002 (2.8 percent).

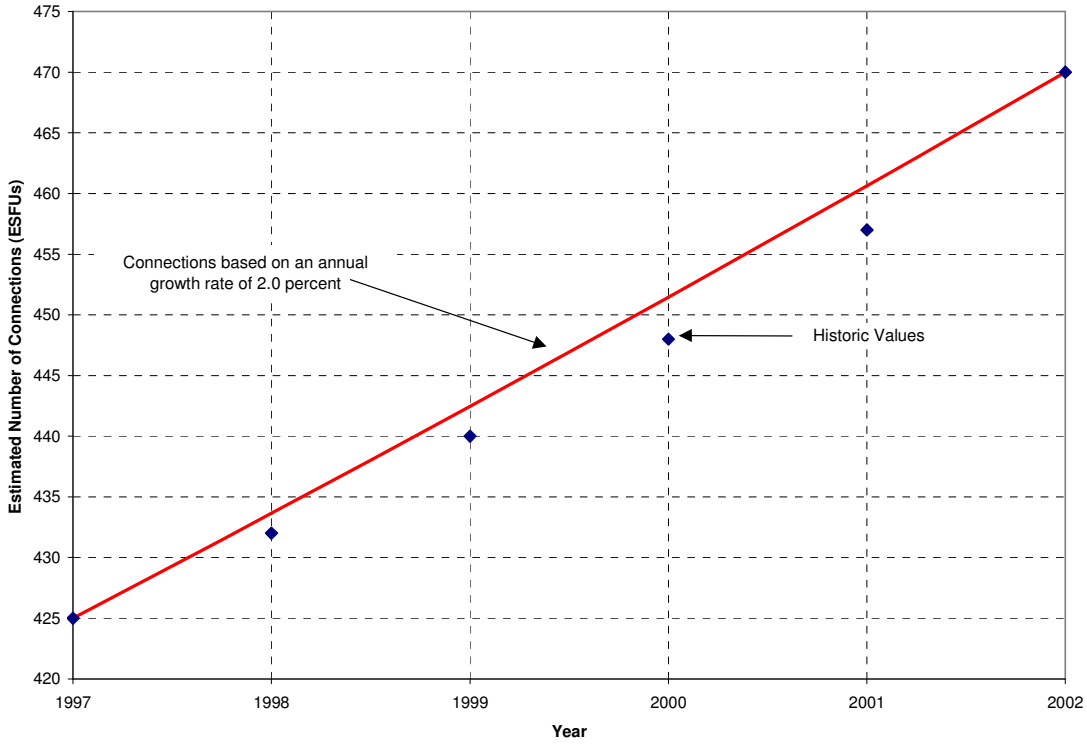


Figure 2. Connections to the Forest Meadows Treatment Plant and Reclamation Facility

Future growth within the community of Forest Meadows is a critical factor, and will be used to identify specific improvements and phasing requirements for the respective wastewater treatment systems.

A meeting was held at the Forest Meadows Club House on December 16, 2002 to discuss growth within the community. Representatives from the developers, the District and HDR staff were present. Based on the projections provided by the developers during the meeting and subsequent information provided by Mr. Lou Papais (Papais, January 2003), there will be 1,400 ESFUs connected to the wastewater collection treatment and disposal facilities at buildout.

Table 1 presents the projected breakdown of existing and new ESFUs within the community. As shown, most of the ESFUs within Forest Meadows will be from new ESFUs.

Table 1. Projected Breakdown of Existing and New ESFUs

Location	Projected ESFUs at Buildout
Units 1, 2, and 4 (existing)	470
Units 1, 2, and 4 (infill)	477
Unit 3 (new)	342
Unit 5 (new)	111
Total	**1,400**

Historic and Projected Flows

Average Dry Weather Flows

Figure 3 shows historic average dry weather influent flows (ADWFs) over the past decade at Forest Meadows. ADWF is defined as being equal to the average of the monthly flows for June, July, August, and September. Between 1992 and 2002, ADWFs increased an average of about 3.6 percent per year, with the highest increase occurring between 1999 and 2000. Between 1997 and 2002, the increase in flow represents an increase of 3.5 percent per year, which is considerably higher than the 2.0 percent growth rate determined from historic connection data (see Figure 2). This result indicates that unit flow contributions are tending to increase.

Table 2 contains a summary of ADWFs and ESFUs for the last five years. As shown, the average dry weather flow on a per ESFU basis has ranged between 94 and 110 gallons per day (gpd) per ESFU. In the past, the District has used a standard rate of 225 gpd per ESFU for service areas outside of Forest Meadows. For planning purposes, a rate of 150 gpd per ESFU has been used historically for Forest Meadows to reflect a larger portion of the community representing second (part time residence) homes.

As described, growth rates based on ESFUs and ADWFs are significantly different; the increase in ADWFs indicate more growth than the ESFU data imply. A previous study (West Yost & Associates, 1993) determined historical data indicated a trend toward higher unit flows. The West Yost report went on to say one possible explanation for this increase was that a larger percentage of new connections may be residences occupied year round (Forest Meadows is typically comprised of residences which are second homes).

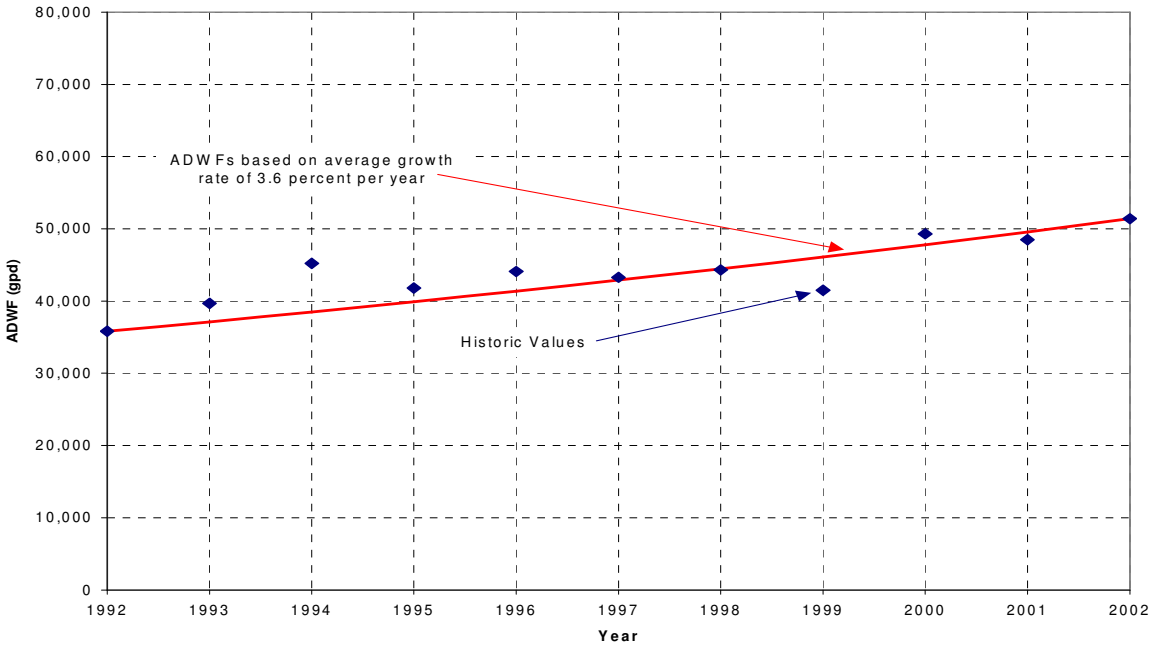


Figure 3. Historic ADWF to the Forest Meadows Wastewater Treatment and Reclamation Plant

Table 2. Summary of ADWFs and ESFUs

Year	Average Dry Weather Flow (gpd)	ESFU	Unit Flow Rates (gal/ESFU)
1997	43,300	425	102
1998	44,300	432	103
1999	41,500	440	94
2000	49,300	448	110
2001	48,500	457	106
2002	51,400	470	109
		Overall Average	104

A standard unit flow rate of 195 gpd per ESFU was recently adopted by the District's Board. This rate was used as the basis for developing the projected ADWF at buildout. To compensate for the trend towards higher wastewater production rates, the current unit flow factor (approximately 110 gpd per ESFU) was assumed to increase to 195 gpd per ESFU over a twenty-year period. This change in the flow contribution from existing connections is

equivalent to an increase of 21.25 gpd per ESFU every five-years. As shown in Figure 4, the current ADWF is 51,400 gpd. The projected ADWF at buildout is 273,000 gpd, which is equivalent to a 430 percent increase above the current ADWF of 51,400 gpd.

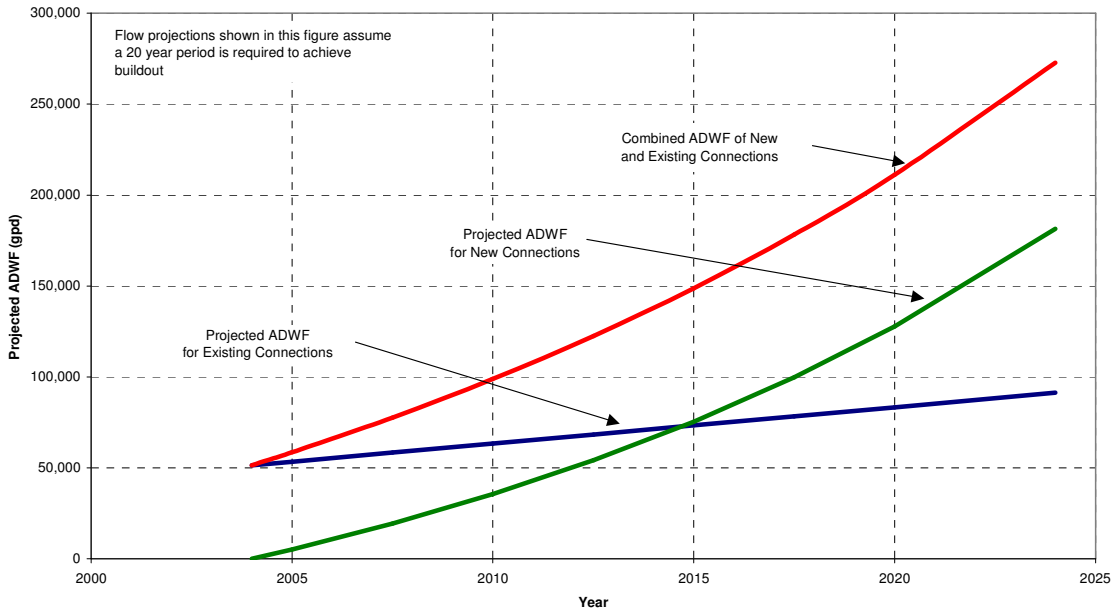


Figure 4 Current and Projected ADWF

Average Annual Flows

Average annual flows are a critical consideration for this particular project. Although average annual flows do not impact the capacity of the collection system or treatment plant, the total volume of effluent generated per year (which is directly related to the average annual flow) impacts capacity needed for both storage and irrigation facilities.

Table 3 shows the ratio of average annual and average dry weather flows range between 1.04 and 1.32, with all but one of the of the ratios falling between 1.04 and 1.13. Based on this analysis, a ratio of 1.13 will be used to project future average annual flows since this ratio represents:

1. The overall average (approximately) of the six ratios.
2. The upper limit if the 1.32 value is considered to be an outlier.

Table 3. Summary of Average Dry Weather and Average Annual Monthly Flows

Year	Average Dry Weather Flow (gpd)	Average Annual Flow (gpd)	Ratio of Average Annual Flow to ADWF
1997	43,300	47,440	1.10
1998	44,300	49,890	1.13
1999	41,500	54,900	1.32
2000	49,300	51,190	1.04
2001	48,500	54,850	1.13
2002	51,400	57,660	1.12
		Overall Average	1.14

Peak Monthly Average Flows

Figure 5 shows historic monthly average influent and estimated infiltration and inflow (I/I) flows between January 1995 and December 2002. I/I flows were calculated based on the difference between average monthly influent and average dry weather dry flows.

As shown in Figure 5, the maximum historic peak monthly average I/I of 4.8 ac-ft occurred in March 1995. During that year, precipitation levels at Forest Meadows were estimated at 63.6 inches. This amount of precipitation approached the 100-year statistical high precipitation level[1] for Murphys (see Table 4).

During that same year, precipitation levels at San Andreas also approached the level associated with the 100-year rainfall return interval while precipitation measured in Big Trees State Park actually exceeded the level associated with the 100-year rainfall return interval.

Based on this comparison, I/I flows measured during March 1995 reflect values that can be expected during the 100-year rainfall return interval. Based on this finding, the current peak monthly average flow is estimated to be 102,000 gpd.[2]

According to engineering design guidelines, infiltration rates can range from 20 to 3,000 gallons/acre-day. However, general consensus is that infiltration/inflow is an independent variable for each service area. This variable depends on the quality of material, workmanship of the sewers, building connections, maintenance, and the elevation of groundwater with respect to that of the collection system. As previously described, peak monthly average I/I flows are estimated at 4.8 ac-ft per month, which is equivalent to a daily flow of 50,450 gpd. Currently, the service area represents an area of approximately 460 acres. Based on the peak I/I flows of 4.8 ac-ft per month and the current service area of 460 acres, the estimated peak monthly average I/I flow is 110 gallons/acre-day. This I/I flow, which is based on a 100-year rainfall

[1] Hereafter referred to in this report as the 100-year rainfall return interval.
[2] 102,000 gpd is equal to sum of the current ADWF of 51,400 gpd and the estimated I/I flow of 4.8 ac-ft/month (50,450 gpd) associated with 100 year precipitation.

return interval, is on the low end of the 20 to 3,000 gallons/acre-day range of the published guidelines.

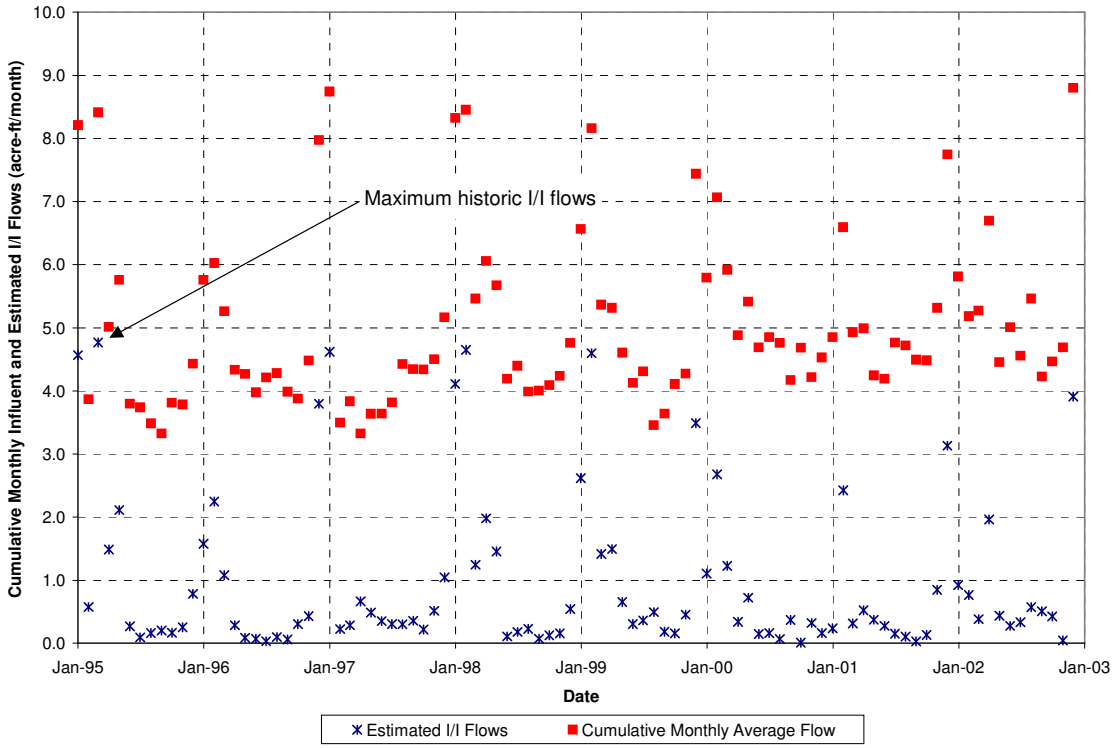


Figure 5. Historic Monthly Average Influent Flows and Infiltration and Inflow

Table 4. Summary of Calaveras County Rainfall Frequency Data

Weather Station	Annual Precipitation (inches)[a]		
	Average (Historic)	1995 (Historic)	Levels Predicted for 100-year Return Period
Murphys (Elevation 1,720 ft)	35.9	N/A[b]	64.9
San Andreas (Elevation 1,100 ft)	27.5	48.8	49.8
Big Trees State Park (Elevation 4,700 ft)	50.0	92.1	90.4

[a] *Data obtained from the California Department of Water Resources*
[b] *Data not available; Murphys weather station is no longer in operation.*

The District aggressively pursued a collection system rehabilitation program in November 2002 to reduce I/I. Plant staff have been collecting data from eleven control points throughout the collection system to monitor flow once a week, or after rainfall events or snow storms, to help pinpoint exact locations where high levels of I/I are occurring. This data will help the District determine specific locations for collection system improvements and rehabilitation.

Moreover, future expansions of the Forest Meadows collection system will be designed and constructed to minimize I/I. Based on this information, it appears the current peak monthly average I/I flow will be limited to (at most) the current rate of 110 gallons/acre-day. Based on this assumption and the estimated buildout service area (consisting of roughly 875 acres), the peak monthly average flow was estimated to be 369,250 gpd at buildout based on the following formula:

$$\text{Peak Monthly Flow}_{\text{Buildout}} = \text{ADWF}_{\text{Buildout}} + (\text{I/I Rate}_{\text{Peak Month}})(\text{Service Area}_{\text{Buildout}})$$

where:

$\text{ADWF}_{\text{Buildout}}$ = 273,000gpd

$\text{I/I Rate}_{\text{Peak Month}}$ = 110 gallons/acre-day

$\text{Service Area}_{\text{Buildout}}$ = 875 acres

Summary of Current and Projected Buildout Flows

Table 5 presents a summary of current and projected flows and the current discharge limitations obtained from the WDR. Both the ADWF, average annual, and peak monthly average flows will be used to assess the treatment plant, storage, and irrigation facilities. The peak hour flows will be used to assess the collection system and the treatment plant headworks.

Table 5. Summary of Current and Buildout Wastewater Characteristics

	Units	Current (2002)	Buildout (projected)	WDR Limitations
Average Dry Weather Flow (ADWF)	gpd	51,400	273,000	190,000
Average Annual Flow	gpd	58,100	308,500	--
Peak Monthly Average Flow	gpd	102,000	369,000	280,000
Peak Hour Flow[a]	gpd	205,000	925,500	--

[a] Current and projected peak hour flows are based on assumed peaking factors of 3.5 and 3.0 respectively, and the current and projected average annual flows.

3. Regulatory Considerations

This section presents a summary of current waste discharge requirements for the Forest Meadows Wastewater Treatment Plant and Reclamation Facility. In addition, potential changes to the WDR that may be made in the future are discussed.

Waste Discharge Requirements

The current WDR (Order No. 5-00-066) for the Forest Meadows Wastewater Treatment and Reclamation Facility were adopted by the RWQCB on March 17, 2000. As previously described, treated effluent is used exclusively for irrigating the Forest Meadows Golf Course. Effluent criteria, as well as redundancy and reliability features of the treatment plant, storage, and irrigation facilities must be in compliance with Title 22, California Code of Regulations, Section 60301, *et seq*. (hereafter referred to as Title 22). The permit covers discharge prohibitions and specifications, effluent limitations, reclamation and solids disposal requirements, groundwater limitations, a self-monitoring program, and provisions. Portions of the WDR pertinent to wastewater treatment, reclamation, storage, and disposal requirements are discussed below. Appendix A contains a copy of WDR Order No. 5-00-066.

Title 22 Overview and Category of Recycled Water

Since its promulgation in 1978, Title 22 has been in a nearly continuous state of revision. Its most recent version was formally adopted by state regulators on September 24, 2000. This version lists the principal categories of recycled water, and then lists the types of recycled water applications that can be supported by each category of recycled water based on design, operational, and water quality criteria. The following is a summary of the four principal categories of recycled water:

- **Undisinfected Secondary:** Oxidized wastewater (typically secondary effluent) which has not been subjected to disinfection
- **Disinfected Secondary 23:** Oxidized wastewater that has been disinfected so that the median concentration of total coliform bacteria does not exceed a most probable number (MPN) of 23 per 100 ml
- **Disinfected Secondary 2.2:** Similar to Disinfected Secondary 23, except that the MPN requirement is 2.2 per 100 ml instead of 23
- **Disinfected Tertiary:** Wastewater that has been filtered and subsequently disinfected so that the median density of total coliform bacteria does not exceed a MPN of 2.2 per 100 ml

The Forest Meadows Golf Course is categorized as an unrestricted golf course. According to Title 22, treated effluent applied to this course must comply with the Disinfected Tertiary criteria. To maximize the use of this resource, the District may also want to consider other applications for this grade of recycled water. Other potential uses include irrigation for parks,

playgrounds, residential landscaping, freeway landscaping, orchards, vineyards, fodder crops, and decorative fountains.

Article 10 (of Title 22) currently allows a combination of emergency storage/disposal and redundant units to satisfy specific reliability requirements as outlined in Title 22. Two potential emergency storage/disposal scenarios, which are described as "short-term" and "long-term" are defined in Title 22. Short-term storage/disposal is defined as providing emergency storage/disposal facilities capable of storing and/or disposing untreated or partially treated wastewater for a period of twenty-four hours. Long-term storage/disposal has a similar definition except the time period. It allows 20 days of storage as opposed to twenty-four hours.

The primary advantage of selecting the long-term storage/disposal alternative is the elimination (or significant reduction) of redundant units for biological and tertiary treatment. A comparison of the relative advantages and disadvantages of the two storage/disposal options was developed as part of this project. The short-term option is the recommended alternative due to the magnitude of the relative construction costs required to meet the 20-day storage option. Based on this finding, the subsequent treatment plant and storage improvements described in this report will be based on providing 24-hours of emergency storage and providing the necessary reliability features defined by Title 22 for this option.

Numerical Effluent Limits

Table 6 summarizes the treated effluent requirements listed in the WDR.

Table 6. Summary of Effluent Limits

Constituent	Units	Effluent Limitations			
		Monthly Average	Daily Maximum	Weekly Median	Daily Average
Total Coliform Organisms	MPN/100 mL	--	23	2.2	--
Settleable Solids	mL/L	0.2	0.5	--	--
BOD[a]	mg/L	20	30		
Turbidity	NTU	--	--	--	2

[a] *Five day biochemical oxygen demand at 20 degC.*
[b] *Not to exceed 5 NTU more than 5 percent of the time during a 24- hour period.*

Other Requirements and Provisions

In addition to the limits shown in Table 6, the District must comply with the following key specifications:

- **Discharge Limits**
  - The treatment plant is allowed to treat ADWF up to 190,000 gpd and peak wet weather flows up to 280,000 gpd.

- Effluent discharge, in combination with other sources, shall not cause underlying groundwater to contain waste constituents statistically greater than background water quality, except for coliform bacteria. For coliform bacteria, increases shall not cause the most probable number of total coliform organisms to exceed 2.2 MPN/100ml over any 7-day period.
- The discharger shall comply with the Monitoring and Reporting Program No. 5-00-066, which is included as part of the WDR.

Storm and Wet Weather Considerations

- The treatment plant and storage facility must be designed, constructed, operated, and maintained to prevent inundation or washout due to floods associated with a 100-year rainfall return interval or less.
- The Storage Facility must have sufficient capacity to contain all reclaimed wastewater flow, design seasonal precipitation, seasonal ancillary influent and infiltration during the wet season. Design seasonal precipitation shall be based on total annual precipitation using a return frequency of 100 years.
- The discharger may not irrigate with effluent during periods of precipitation and for at least 24 hours after cessation of precipitation, or spray irrigate when wind velocities exceed 30 mph.

Storage Facility

- The freeboard in all ponds at the treatment plant and storage facility shall never be less than two feet as measured vertically from the water surface to the upper surface of the lowest adjacent dike or levee.
- On or about October 15th of each year, the available storage facility capacity shall be at least equal to the volume necessary to comply with the three storm and wet weather considerations and the freeboard allowance.
- Provision B.4 of the WDR requires leach fields to have sufficient capacity, providing at least 20 days of emergency disposal. If this capacity is not reached, the District may incorporate an on-site emergency storage basin to meet this provision. Although the leach fields may only be used when the final effluent turbidity exceeds 2 NTU's, it is likely this 20 day emergency storage/disposal requirement will stay in effect.
- Dissolved oxygen concentrations shall not be less than 1.0 mg/L in the storage facility to minimize objectionable odors. Oxygen concentrations shall be measured at a point located as far as practicable from the inlet and within one foot of the water surface.

- **Irrigation**
  - Runoff from the irrigation field (i.e., golf course) shall not be discharged to any surface water drainage course within twenty-four hours of the last application of reclaimed water.
  - The leachfield area serves as a long-term reliability feature. According to the WDR, disposal to the leachfields is permitted during periods of plant repair, to prevent spillage at the Storage Pond, or when treated effluent does not meet the recycled water standards.

Possible Changes to WDR and Areas of Concern

The current WDR are scheduled to expire in fiscal year 2010. The RWQCB and the DHS were contacted on December 23, 2002 to discuss potential changes and/or additions the District might expect in the future. These agencies also provided insight about their perceived areas of concern for the Forest Meadows treatment facility. A summary of that information is below:

- At this time, the DHS has no plans to revise or revisit Title 22 requirements adopted in 2000. Given the length of time required to update the Title 22 requirements, it appears the current version will remain intact for the foreseeable future. Therefore, numerical limitations shown in Table 6 are expected to remain constant throughout the planning period, assuming all of the treated effluent is reclaimed.
- Groundwater monitoring requirements for the storage reservoir and golf course are likely to be added when the WDR are renewed. If monitoring shows groundwater deterioration:
  - Additional effluent limits (such as nitrogen removal) may be in order, or
  - Effluent application will be required at agronomic rates, and the reservoir will have to be lined.
- Both the WDR and the CAO contain several provisions for ensuring the Storage Facility and golf course comply with all aspects of Title 22. Both the RWQCB and DHS will continue to monitor the treatment plant, storage, and irrigation area until compliance is demonstrated. In particular, the RWQCB is focusing on the following components:
  - **Emergency Storage:** Section 60341 of Title 22 requires reclamation facilities provide emergency storage or disposal facilities for the purpose of storing or disposing untreated or partially treated wastewater. The RWQCB has indicated the plant must provide sufficient storage and disposal capacity to contain 20 days of effluent flow.
  - **Freeboard:** Provision B.7 of the WDR requires that a minimum two feet of freeboard be provided in the storage reservoir at all times. Notices of Violation were issued by RWQCB in October 2001 and again in April 2002 for failure to meet the two foot freeboard requirement.

- **Golf Course:** The RWQCB conducted an inspection of the Forest Meadows Golf Course on September 19, 2002. A copy of the inspection report is attached in Appendix A. During the inspection, RWQCB staff observed the following violations:
  - Reclaimed water over-sprayed into surface water drainage courses adjacent to golf course fairways, greens, and into surface water drainage courses.
  - The irrigation pumping station located adjacent to the effluent storage pond and sprinkler heads, quick connect couplers, and valve boxes were not properly labeled and marked.
  - During the inspection, golf course staff did not know where liquid collected from sand trap underdrains was routed. If it is determined the underdrains discharge to surface water drainage courses, the drains must be redirected so treated effluent will not enter any surface water drainage course.
  - Title 22 requires reclaimed water irrigation pipe be painted purple to ensure cross connections with potable water supplies do not occur. The existing golf course irrigation pipe is not painted purple. Mr. Joe Spano of DHS stated his department would not require underground irrigation piping to be retrofitted to comply with the purple pipe requirement. However, Mr. Spano did state the golf course must clearly label and mark (with purple paint) all above ground reclaimed water distribution apparatus, including water controllers, valves, sprinkler heads, and quick coupler fittings.
- **CAO Scope of Work and Compliance Schedule:** The CAO ordered a timeline for meeting Title 22 and WDR requirements. The order stipulates the following documentation requirements and schedule of improvements:
  - October 1, 2002 (Completed) – Effluent Storage Management Plan. The report is to explain how the effluent storage pond will be managed to continuously meet the two foot freeboard requirement prescribed in the WDR.
  - October 1, 2002 (Completed) – Storage and Alternative Disposal Contingency Plan. The plan is to describe how the dischargers will store and/or adequately dispose of inadequately treated wastewater if the leach fields fail.
  - January 30, 2003 – Engineering Facility Plan (a preliminary draft of this report was submitted by this date to the RWQCB).
  - March 30, 2003 – Revenue Plan. This document is to describe the costs associated with construction of the 20-day emergency storage pond and show whether the dischargers have the necessary funds to implement the improvements.
  - December 1, 2003 – Final Design Documents for the Emergency Storage Pond.

- December 1, 2003 – Title 22 Engineering Report. The report is to contain the information listed in the *Guidelines for the Preparation of an Engineering Report for the Production, Distribution, and Use of Recycled Water*. The District has initiated a project to develop the required Title 22 Engineering Report with HDR.
- January 1, 2004 – Updated Report of Waste Discharge.
- November 1, 2004 – Certification of Emergency Storage Pond Completion.

4. Description of Existing Facilities

The existing wastewater facilities serving Forest Meadows consists of a collection system, treatment plant, storage reservoir, and irrigation system. This section briefly describes the attributes of each facility and gives a summary of results derived from a capacity evaluation of the wastewater facilities.

Wastewater Collection System

The collection system is primarily a gravity system comprised of approximately 55,000 lineal feet of PVC pipe (primarily 6-inch diameter pipe), and three lift stations as shown in Figure 6.

Lift Station 1 is located at the northwest corner of the community. This station conveys wastewater collected from Unit 1-F to Forest Meadows Drive (located just south of Unit 1-F) via a 4-inch PVC forcemain.

From this point, wastewater flows by gravity to Lift Station 2. Wastewater collected throughout the community is pumped from Lift Station 2 through an 8-inch ACP/10-inch PVC forcemain to the treatment plant. This lift station is located near the Forest Meadows Golf Course, approximately 2,200 ft from the treatment plant. Both Lift Stations 1 and 2 have holding tanks (approximately 10,000 and 45,000 gallons, respectively) to attenuate peak flows conveyed to the treatment plant. The wastewater collected at Azalea Court (10 connections), is brought to the main collection system grid by the Azalea Court Lift Station. Most of the wastewater collected in the southern part of the system flows by gravity to Lift Station 2. The following is a summary of design criteria for three lift stations:

Azalea Court Lift Station

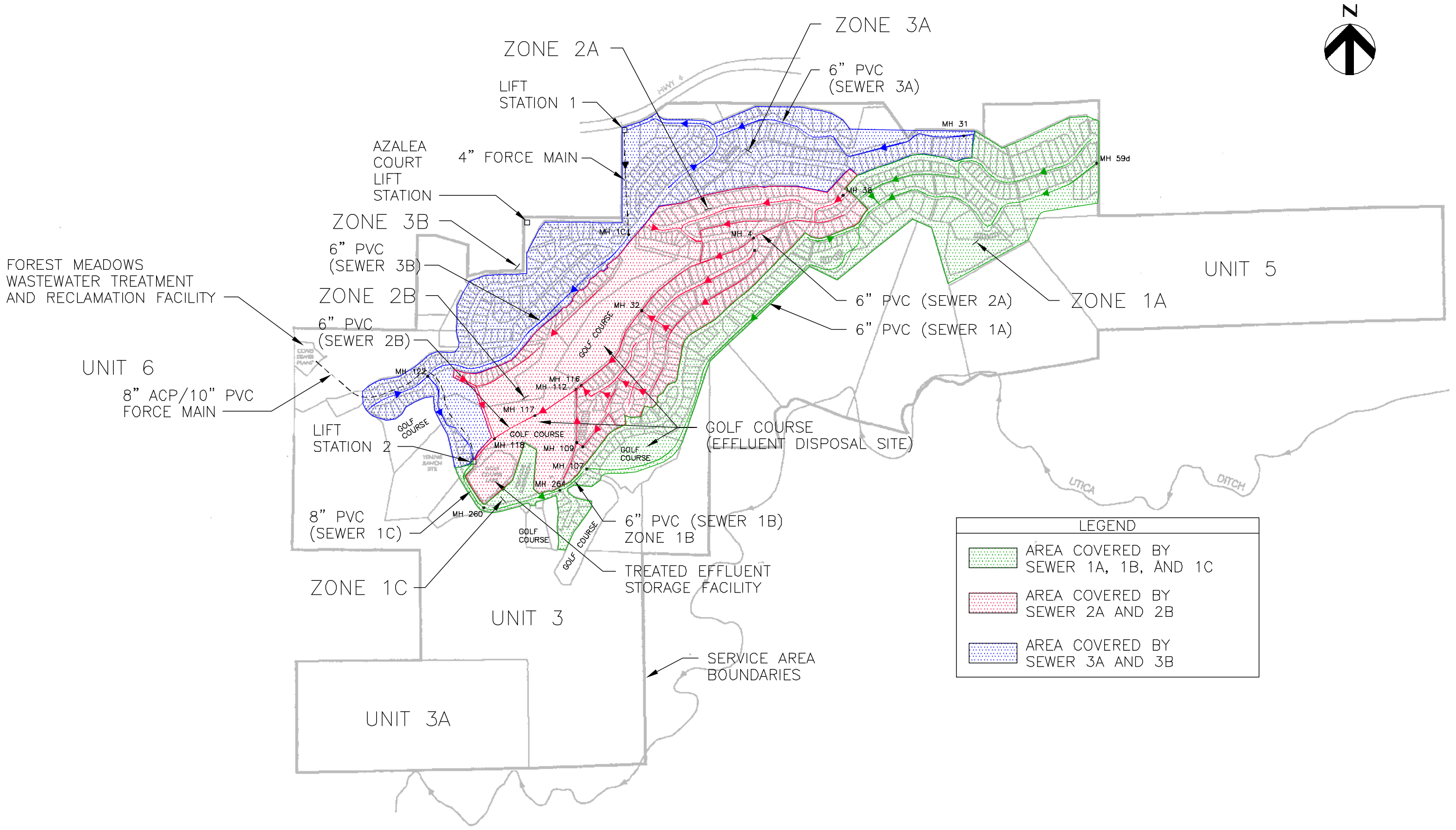
Number of Pumps:	2
Size:	15 HP
Rated Capacity:	300 gpm each
Number of Connections Served:	10 ESFUs

Lift Station 1

Number of Pumps:	2
Size:	20 HP
Rated Capacity:	200 gpm each
Number of Connections Served:	150 ESFUs

Lift Station 2

Number of Pumps:	2
Size:	30 HP
Rated Capacity:	420 gpm each
Number of Connections Served:	All (470 ESFUs currently)



FOREST MEADOWS
COLLECTION SYSTEM

HDR

Figure 6

Wastewater Treatment and Reclamation Plant

Treatment plant facilities include preliminary screening, flow measurement, secondary treatment consisting of a complete mix basin and a sludge-settling storage basin, two continuous backwash filters, and ultraviolet (UV) light disinfection. A process schematic and site plan of the treatment facility are shown in Figure 7 and Figure 8. The following is a summary of key design parameters of the major unit processes within the treatment plant.

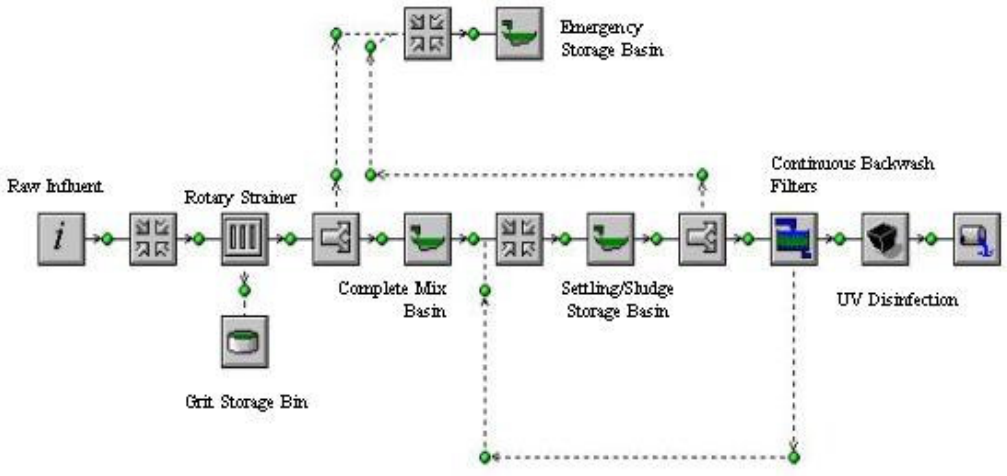


Figure 7. Forest Meadows Treatment Plant Process Schematic

Headworks

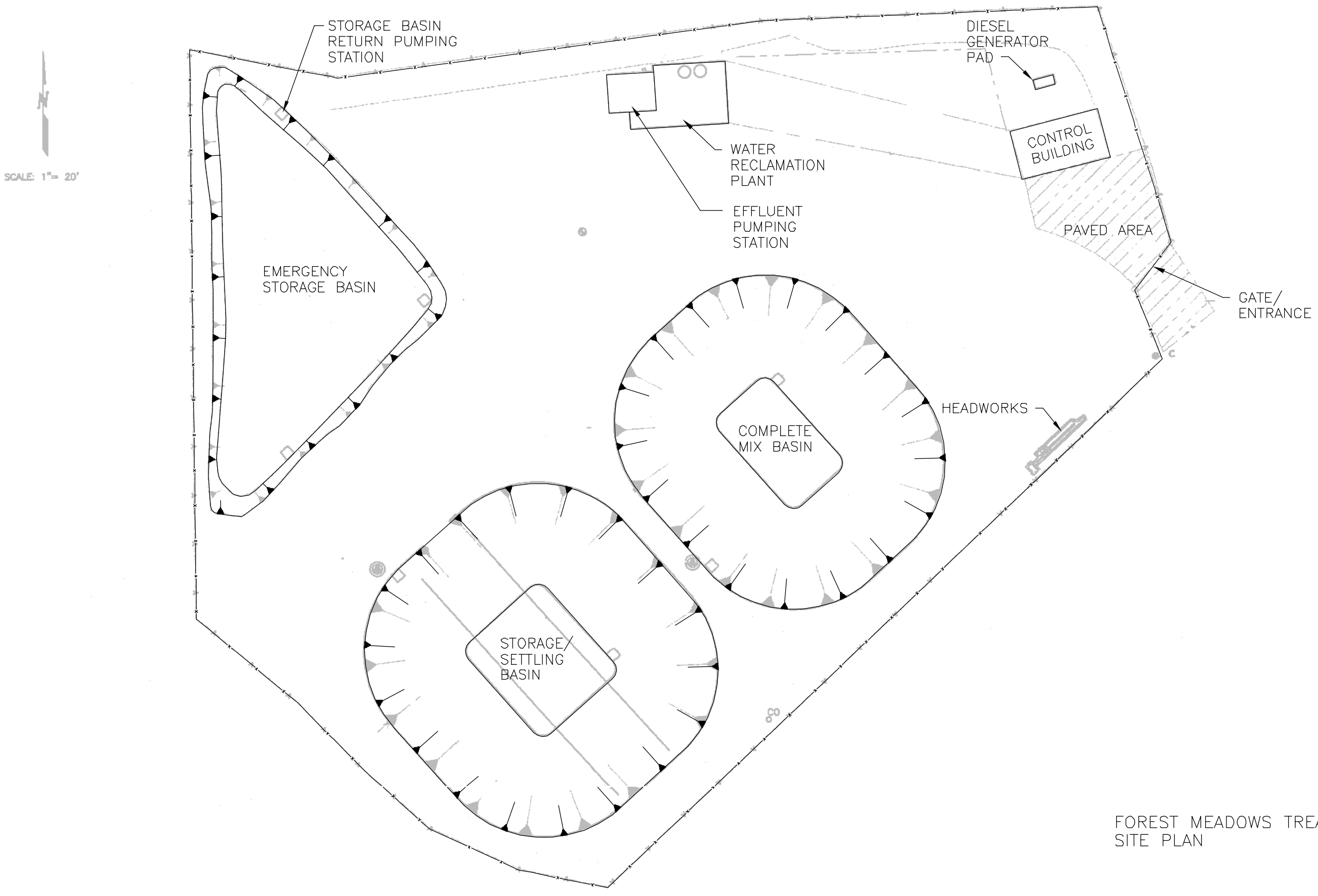
Screening

Number of Units:	1
Type:	Rotary Strainer[3]
Opening Size:	¼ inch
Rated Capacity:	690 gpm
Other Features:	18-inch bypass channel with manual screen

Flow Measurement

Number of Units:	1
Type:	Parshall flume
Throat Width:	3-inch
Rated Capacity	
Minimum Flow:	12.5 gpm
Maximum Flow:	834 gpm
Other Features:	Ultrasonic level sensor

[3] Screen is manufactured by Lakeside Equipment Company, Model 12MS Microstrainer.



FOREST MEADOWS TREATMENT PLANT
SITE PLAN

HDR

Figure 8

Secondary Treatment

Complete Mix Basin

Number of Basins:	1
Type:	Complete Mix
Volume:	600,000 gallons
Design Criteria	
ADWF HRT[4] (min):	3.2 days
PWWF HRT (min):	2.1 days
Aerators	
Type:	Mechanical surface aerators
Number:	3
Size:	5 HP

Sludge/Settling Storage Basin

Number of Basins:	1
Type:	Partial Aeration/Settling
Volume:	600,000 gallons
Design Criteria	
ADWF HRT (min):	2.5 days
PWWF HRT (min):	1.7 days
Aerators	
Type:	Mechanical surface aerators
Number:	4
Size:	1 HP
Other Features:	Serpentine pattern, baffled curtains – one partial mix zone and two settling zones

Tertiary Treatment

Continuous Backwash Filters

Number of Units:	2
Diameter:	5-ft
Media Type:	Sand
Filter Area:	19 ft (each); 38 ft^2 (total)
Design Criteria	
ADWF HLR[5]:	1.5 gpm/sf
PWWF HLR:	2.3 gpm/sf
Backwash Production:	20 percent

[4] Hydraulic Retention Time.
[5] Hydraulic Loading Rate.

Backwash Pumping Station

Number of Pumps:	2
Capacity:	45 gpm (each)
Size:	1.5 HP

UV Disinfection

Number of Units:	1
Type:	Low-pressure, high intensity[6]
Number of Lamps:	24 total
Number of Channels:	4
Channel Dimensions	
Width:	0.21 meters
Height:	0.33 meters
Length:	1.43 meters
Total Length:	39.4 ft
Average Intensity:	9.15 mW/cm^2
Average Dose	
Peak Flow:	172.8 mWs/cm^2
Average Flow:	254.6 mWs/cm^2

Reclaimed Water Pumping Station

Number of Pumps:	2
Capacity:	200 gpm (each)
Size:	10 HP

Emergency Storage Facilities

Emergency Storage Basin

Number of Basins:	1
Type:	Emergency storage
Volume:	400,000 gallons (approximately)
Other Features:	Overflow from Headworks or from Settling/Sludge Storage Basin

Emergency Storage Basin Return Pumps

Number of Pumps:	2
Capacity:	100 gpm (each)
Size:	2.0 HP

[6] UV Disinfection system is manufactured by Wedeco; Model TAK-3-1/143x4W.

Leachfield

Rated Capacity:[7] 22,500 gpd

Storage Facility

Treated effluent is stored in the existing Storage Facility located along Sandalwood Drive in the Forest Meadows Golf Course. The storage facility is operated by the golf course owners in accordance with the Effluent Storage and Disposal Agreement (Resolution No. 98-40, June 1998).

The storage facility has a total capacity of approximately 109 acre-feet and an estimated catchment area of 9.1 acres.[8] However, there are some drainage modifications that can potentially reduce the catchment area to 8.0 acres.

Currently, for aesthetic purposes, the irrigation pump intake is set so the pond volume cannot drop below a level corresponding to a volume of roughly 50.6 ac-ft. This requirement limits the net useable capacity for storage of treated effluent to about 58.5 ac-ft (see Figure 9). At this volume, the pond surface area is approximately 5 acres and the total pond volume is 109 ac-ft.

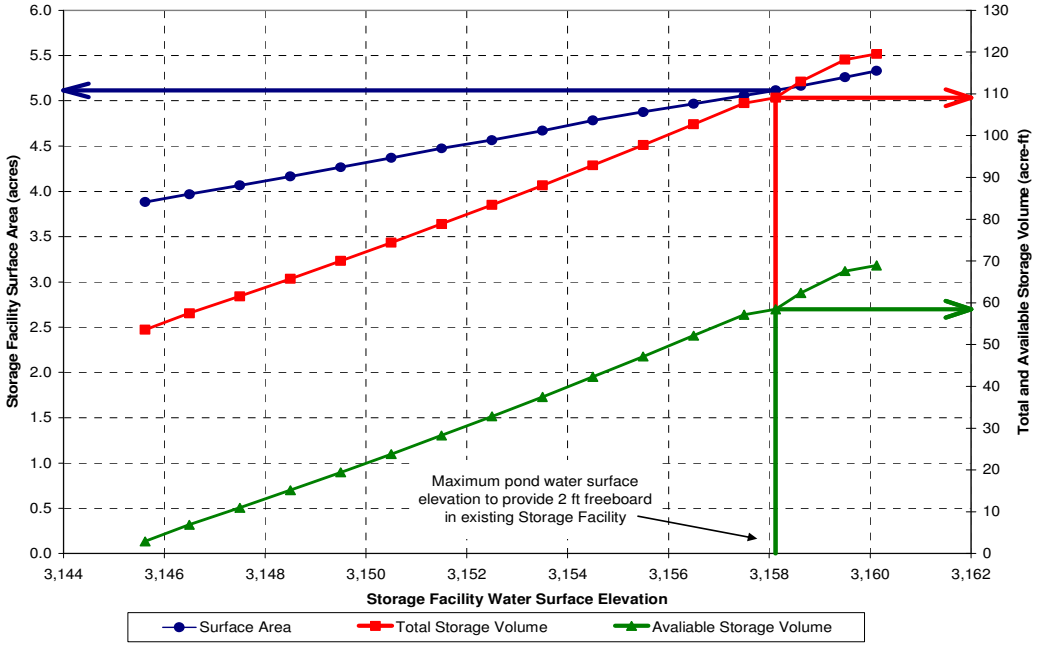


Figure 9. Storage Facility Characteristics

[7] Equal to the capacity presented in the *Forest Meadows Wastewater Treatment and Disposal Facility 20 Day Emergency Storage Evaluation Report*, dated September 1, 2000.
[8] Volume based on providing a two foot freeboard in accordance with the WDR. Catchment area was independently measured by HDR using a hand help global positioning system (GPS) device.

Effluent Disposal

Treated effluent is used to irrigate the community golf course via spray irrigation. The golf course has 40 acres of turf. During the summer and fall seasons, the reported daily irrigation demands are between 210,000 and 290,000 gpd. Based on these values, the estimated irrigation demand is on the order of 55.8 in/ac-yr. This value appears to be overly optimistic compared to agronomic rates and irrigation demands obtained from two nearby golf courses. Table 7 contains a summary of irrigation demands, irrigation area, and annual irrigation rates obtained from these other sources. As shown, irrigation demands based on these other sources are considerably lower than the 55.8 in/ac-yr value estimated from data obtained from the Forest Meadows Golf Course. Based on this comparison, an average irrigation rate of 35.9 in/ac-yr, which equates to a total irrigation demand of 119.7 acre-ft/yr, will be used for all of the subsequent storage and effluent disposal evaluations presented or discussed in this report.

Table 7. Comparison of Alternative Irrigation Rates

Source	Irrigation Area (acres)	Irrigation Demand (ac-ft/yr)	Irrigation Rate (in/ac-yr)
Saddle Creek Golf Club	100	310	37.2
Greenhorn Creek Resort	110	300	32.7
Agronomic Rates[a]	--	--	37.9
		Overall Average	**35.9**

[a] Based on nitrogen loading rates of 300 lb/yr and an effluent nitrogen concentration of 35 mg/L.

Evaluation of Existing Facilities

Hydraulic, process, and operational capacities of the existing facilities were determined to identify the capacity bottlenecks and improvements required to accommodate future flows. The evaluations described below assume that all wastewater will be conveyed, treated, stored, and disposed of using the existing facilities. Potential solutions for overcoming the capacity bottlenecks identified in this evaluation are discussed and compared in the next section. The following are descriptions of the capacity analyses described in this section:

- **Collection System Model:** Hydraulic capacities of the existing collection system were determined using a computer-based simulator to determine the capacity of the individual trunk sewers and lift stations. In turn, these capacities were used to identify the collection system improvements needed to accommodate future flows.
- **Treatment Plant Assessment:** Process capacities of the existing treatment plant facilities were determined using a treatment plant mass balance model. Model results were compared to site-specific and standard design criteria and constraints.
- **Storage and Irrigation Water Balance Evaluation:** Water balances, based on the 100-year rainfall return interval, were developed to evaluate both the storage and effluent disposal (golf course) facilities.

Wastewater Collection System Evaluation

Evaluations of the collection system trunk sewers and lift stations were performed to identify improvements needed to accommodate future flows as described below.

Collection System Evaluation

The Forest Meadows collection system is divided into the following three main trunk sewers as shown in Figure 6. Together, all three trunk sewers convey all wastewater produced in the Forest Meadows service area to Lift Station 2.

- **Trunk Sewer 1:** The total length of this trunk sewer is approximately 21,650 linear feet. This trunk sewer is comprised of the following segments:
  - Sewer 1a: 6-inch PVC pipeline located upstream of manhole 107.
  - Sewer 1b: 6-inch PVC pipeline located between manholes 107 and 264.
  - Sewer 1c: 8-inch PVC pipeline located between manhole 264 and Lift Station 2.
- **Trunk Sewer 2:** The total length of this trunk sewer is approximately 10,500 linear feet. This trunk sewer is comprised of the following segments:
  - Sewer 2a: 6-inch PVC pipeline located upstream of manhole 112.
  - Sewer 2b: 6-inch pipeline located between manhole 112 and Lift Station 2.
- **Trunk Sewer 3:** The total length of this trunk sewer is approximately 30,250 linear feet. This trunk sewer is comprised of the following segments:
  - Segment 3a: 6-inch PVC pipeline located upstream of Lift Station 1.
  - Segment 3b: 6-inch PVC pipeline located between Lift Station 1 and Lift Station 2.

The trunk sewers demarcates the areas served into the following zones:

- Zone 1a: Area served by trunk sewer between MH 59> and MH 107.
- Zone 1b: Area served by trunk sewer between MH 107 and MH 264.
- Zone 1c: Area served by trunk sewer between MH 264 and Lift Station 2.
- Zone 2a: Area served by trunk sewer between MH 38 and MH 112.
- Zone 2b: Area served by trunk sewer between MH 112 to Lift Station 2.
- Zone 3a: Area served by trunk sewer between MH 31 and Lift Station 1.
- Zone 3b: Area served by trunk sewer between MH 1< and Lift Station 2.

A summary of the number of connections (in terms of ESFUs) and the estimated peak hour flow rate routed through each sewer segment is presented in Table 8. The number of connections and flow rate shown in this table for each sewer segments are based on the sewer

system layout drawings obtained from the District. These drawings show a total of 677 connections, which exceeds the current estimated number of connections of 470 ESFUs.

Information obtained from the sewer system drawings (such as pipeline invert elevations, distances between manholes, and the number of connections contributing flow to a specific sewer segment) was incorporated in the model. Once configured, the model was used to evaluate the collection system based on current conditions and estimate the total number of connections each sewer could accommodate in the future. A summary of the estimated capacities and available capacity (in terms of additional ESFUs that can be accommodated by a specific sewer segment) is provided in Table 9. A copy of the design criteria, assumptions, calculations, and results of the collection system model are provided in Appendix B.

Table 8. Summary of the Estimated Connections and Peak Hour Flows for Each Sewer Segment

Sewer Segment	Estimated Number of Sewer Connections (ESFUs)	Estimated Peak Hour Flow at Limiting Sewer Segment (gpm)[a]	
		Current Flow Contribution	Future Flow Contribution
1a	125	36	54
1b	150	45	63
1c	156	45	72
2a	161	49	72
2b	209	54	81
3a	149	40	67
3b	293	90	135

[a] Peak hour flow was derived from the current and future average dry weather flow contributions of 110 gpd/ESFU and 195 gpd/ESFU, respectively.

Table 9. Summary of Available Capacity in Existing Sewer Segments

Sewer Segment	Estimated Capacity[a] (gpm)	Available Capacity[b]	
		Peak Hour Flow (gpm)	Equivalent Connections (ESFUs)
1a	108	55	121
1b	206	142	309
1c	238	168	365
2a	108	34	74
2b	215	134	291
3a	139	75	163
3b	144	11	23

[a] Based on a maximum d/D of 50 percent for 6-inch sewers and 67 percent for 8-inch sewers.
[b] Based on the future average dry weather flow contribution of 195 gpd/ESFU.

Flow from future developments in Units 2 and 3 may be routed to sewer segments 2b and 1c. For Unit 2 expansion, a total of 290 ESFUs may be routed to sewer segment 2b at manhole 117. For Unit 3, a total o0f 365 additional ESFUs may be routed to sewer segment 1c at manhole 260.

The available capacity of Trunk Sewer 1 is considered to be marginal because a large portion of the flow from future developments in Units 5 and 3 may be routed to sewer segments 1a and 1c, respectively. One option to rectify this capacity limitation is to allow only 120 additional ESFUs to connect to sewer segment 1a. The remainder of new connections from Units 3 and 5 would connect to Sewer 1b at manhole 265, provided that the total increase in flow did not exceed 310 ESFUs. Another option is to install a new trunk sewer in Unit 5 that would convey wastewater directly to Lift Station 2. This sewer would be located near the south boundary of Units 3 and 5, thereby eliminating the need to connect to Trunk Sewer 1 altogether.

Lift Station Evaluation

The following are descriptions of the two largest lift stations located in the Forest Meadows service area:

- **Lift Station 1:** This station conveys all wastewater collected by sewer segment 3a to sewer segment 3b via a 4-inch force main. This lift station is located along the northern boundary of Forest Meadows as shown in Figure 6. Lift Station 1 is expected to have relatively few (if any) connections added in the future because its service area is near buildout.
- **Lift Station 2:** This station conveys all wastewater collected throughout the service area to the wastewater treatment plant through an 8-inch force main. This lift station is located adjacent to the treated effluent storage facility as shown in Figure 6.

An evaluation of these two lift stations and force mains was performed based on the pumping capacity and the maximum flow velocity through each force main. Summaries of the lift station characteristics and estimated pumping requirements for current and future flows are presented in Table 10. A description of the design criteria and assumptions, model setup, results, and calculations is provided in Appendix B.

Table 10. Summary of Station Characteristics and Pumping Requirements

Lift Station	Lift Station Characteristics		Estimated Number of ESFUs		Maximum Required Rate (gpm)	
	Number of Pumps	Rated Capacity[a] (gpm)	Current	Buildout	Current[c]	Buildout[d]
1	2	200	147	147	45	70
2	2	420	470	1,400[b]	145	640

[a] Rated capacity is equal to the firm capacity with one pump out of service for both lift stations.
[b] Assuming that all buildout connections are conveyed to Lift Station 2.
[c] Based on an average dry weather flow contribution of 110 gpd/ESFU.
[d] Based on an average dry weather flow contribution of 195 gpd/ESFU.

According to the District's Improvement Standards, lift stations have adequate capacity to convey peak flows with the largest pump out of service (i.e. firm capacity). Based on this criterion, Lift Station 1 has adequate capacity and does not require a capacity upgrade.

However, the firm capacity of Lift Station 2 is projected to be exceeded when the number of Forest Meadows connections exceeds 915 ESFUs.

Force Main Evaluation

The following are descriptions of the two force mains in the Forest Meadows service area:

- **Force Main 1:** This force main is a 4-inch PVC pipeline that conveys wastewater from Lift Station 1 to sewer segment 3b. The total length of this pipeline is approximately 1,150 linear feet.
- **Force Main 2:** This force main pipeline conveys all wastewater in the Forest Meadows service area to the wastewater treatment plant. From Lift Station 2 to manhole 125, the force main is an 8-inch ACP and from manhole 125 to the treatment plant, the force main is 10-inch PVC. The total length of this pipeline is approximately 1,800 linear feet.

An evaluation of the two force mains was performed to estimate minimum and maximum pipeline velocities. The evaluation was based on pumping capacity (as opposed to flow velocities at peak hour flow), because the pumps in both stations are constant speed. A summary of this evaluation is presented in Table 11. For comparison, minimum and maximum pipe velocities are typically in the range of 2 to 8 feet per second (ft/sec), based on standard design criteria. As shown in Table 11, all of the estimated flow velocities fall within the recommended range, which indicates that the existing force mains have adequate capacity to serve buildout.

Table 11. Summary of Force Main Velocities at Lift Station Capacities

Force Main	Pipe Size and Type	Pumping Rate (gpm)		Flow Velocity (ft/sec)	
		Current	Future	Current	Future
1	4-inch PVC	200	200	5.1	5.1
2	8-inch ACP / 10-inch PVC	420	640[a]	2.7 / 1.7	4.1 / 2.6

[a] Minimum required pumping rate to accommodate buildout.

Treatment Plant Evaluation

A mass balance model of the treatment plant was constructed using HDR's ENVision program. The model incorporates flows and pollutant loads (i.e., BOD and TSS) from both influent and internal recycle streams and calculations loading rates of individual unit processes to assess performance. ENVision provides the ability to calibrate each individual unit process based on historic operating data, or in the absence of operating data, typical performance values. The mass balance model was run for a total of eight scenarios: current and buildout average dry weather, average annual, peak month and peak wet weather flow conditions.

After the mass balance was constructed, loading conditions for each unit process were compared to the design criteria identified in the *Description of Existing Facilities* section. This

comparison determines whether a unit process is under- or over-loaded compared to the design criteria.

Table 12 summarizes the loading conditions under various scenarios of all of the major unit processes within the treatment plant. This table also contains a general description of each process along with the criterion (or criteria), which limit the overall capacity of each unit process.

Treatment plant evaluation results of current and buildout conditions are summarized below:

Current Conditions

All of the unit processes are estimated to have adequate capacity to accommodate this condition except for the following:

- **Mechanical Aerators:** Dual-Power Multicellular Lagoon Systems (DPMC) are specifically designed to minimize algal growth. Typically, the first lagoon cell is aerated at a level that will maintain solids in suspension and provide sufficient oxygen for conversion of influent carbonaceous BOD to carbon dioxide and biomass. The minimum recommended aeration power is typically in the neighborhood of 30 horsepower per million gallons of basin volume (HP/MG). The complete mix basin has a lower installed aeration power (25 HP/MG), which may explain why additional aeration is required in the Settling/Sludge Storage Basin. One additional 5 HP aerator in the complete mix basin will raise the aeration power of the basin above to the recommended 30 HP/MG.

  An additional 1 HP mechanical aerator should be installed in the Settling/Sludge Storage Basin (which currently utilizes only two of its four available aerators) to achieve the recommended aeration power requirements for a DPMC system.

- **DPMC Detention Time:** One of the primary design criteria of DPMC systems is to maintain hydraulic residence time (HRT) in the various lagoon cells below the minimum time required for algae reproduction. Typically, the HRT in the first (aerated) cell is limited to 2.0 to 3.5 days, with the overall HRT of the system being limited to 4 to 5 days. Currently, this system is under-loaded with respect to these recommended guidelines, which may explain why effluent from this biological treatment process contains a significant amount of algae.

- **Tertiary Filters:** One approach for satisfying Title 22 reliability features is to provide multiple filter units. The combined filter capacity must be sufficient to treat the entire flow with one unit out of service. Based on this approach, it appears that the tertiary filters require expansion to satisfy Title 22. However, the need for additional filtration capacity could be delayed or eliminated if a means of removing algae prior to filtration is provided to allow higher filter loading rates to be achieved.

Table 12. Treatment Plant Capacity Assessment

Process	Unit	Physical Description	Size or Capacity per Unit	Standard or Site Specific Design/Operating Criteria			Mass Balance Output (Current Conditions)			Mass Balance Output (Buildout Conditions)		
				Criteria Description	Value	Units	Value	Percent of Rated Capacity	Expansion Needed	Value	Percent of Rated Capacity	Expansion Needed
Headworks	Screening	1 Rotary strainer		Peak Hour Flow Rate	690	gpm	142	21	No	643	93	No
	Flow Metering	1 Parshall flume	3-inch throat width	Peak Hour Flow Rate	834	gpm	142	36	No	643	77	No
Secondary Treatment - DPMC	Complete Mix Basin	1 Rectangular pond	172 ft x 134 ft x 13 ft deep; Volume = 600,000 gal	ADWF HRT (minimum)	3.2	days	11.7	27	No	2.2	146	**Yes**
				Peak Month HRT (minimum)	2.1	days	5.9	36	No	1.6	130	**Yes**
		3 Mechanical aerators	5 HP each; 15 HP total	HP/MG of Basin[a]	30	HP/MG	25	120	**Yes**	25	120	**Yes**
	Sludge/Settling Basin	1 Rectangular pond	172 ft x 134 ft x 13 ft deep; Volume = 600,000 gal	ADWF Minimum HRT	2.5	days	10.2	25	No	2.1	119	**Yes**
				Peak Month HRT (minimum)	1.7	days	5.5	31	No	1.6	107	**Yes**
		4 Mechanical aerators (available)	1 HP each; 4 HP total	HP/MG of Basin[a]	5	HP/MG	6.7	75	No	6.7	75	No
		2 Mechanical aerators (operating)	1 HP each; 2 HP total	HP/MG of Basin[a]	5	HP/MG	3.3	152	**Yes**	3.3	150	**Yes**
Tertiary Treatment	Continuous Backwash Filters	2 Dynasand	5 ft Diameter, 19 sf each	ADWF Loading Rate, 1 unit out of service	1.5	gpm/sf	2.1	137	**Yes**	10.0	673	**Yes**
				Peak Month Loading Rate, 1 unit out of service	2.3	gpm/sf	3.9	170	**Yes**	13.6	590	**Yes**
				ADWF Loading Rate, All units in service	1.5	gpm/sf	0.9	67	No	5.1	340	**Yes**
				Peak Month Loading Rate, All units in service	2.3	gpm/sf	2.0	85	No	6.8	295	**Yes**
	Backwash Pumps	2 Pumps	45 gpm each	20 % recycle at Peak Hour Flow, 1 unit out of service[b]	45	gpm	28	62	No	129	286	**Yes**
				20% recycle at Peak Hour Flow, all units in service	45	gpm	28	31	No	129	143	**Yes**
Disinfection	UV Disinfection System[b]	4 Channels total (1 standby)	0.21 (wide) x 0.33 (height) x 1.43 (length) meters, 24 lamps total	Average Flow w/3 banks in service	27.8	seconds	92.8	30	No	17.4	160	**Yes**
				Peak Hour Flow w/3 banks in service	18.9	seconds	52.9	36	No	5.8	325	**Yes**
Reclaimed Water Pumping Station	Pumps	2 Pumps	200 gpm each	Peak Hour Flow, 1 unit out of service[b]	200	gpm	142	71	No	642	321	**Yes**
				Peak Hour Flow, All units in service	200	gpm	142	36	No	642	161	**Yes**
Emergency Storage Basin	Storage Basin	1 Basin	400,000 gal	Average Annual	20	days	6.9	290	**Yes**	1.3	1540	**Yes**

a Horsepower requirement based on recommended criteria obtained from Rich, L.G. 1980. *Low-Maintenance, Mechanically Simple Wastewater Treatment Systems*, McGraw-Hill Book Company, New York, NY.

b The District's Improvement Standards recommend that pumping stations have adequate capacity with the largest unit out of service.

c The existing UV disinfection system was designed in accordance with all applicable regulatory requirements. However, in January 2001, DHS adopted the National Water Research Institute's guidelines. These guidelines are more stringent in regard to lamp age/sleeve fouling factors and equipment performance validation (National Water Research Institute, December 2001).

- **Emergency Storage:** As shown in Table 12, the existing emergency storage basin can provide approximately seven days of storage. This degree of storage does not satisfy the 20 days of emergency storage required in the WDR.

Buildout Conditions

As described below, all of the unit processes, with the exception of the screen, are estimated to require expansion to accommodate buildout:

- **Flow Measurement:** As shown in Table 12, peak hour influent flows are estimated to exceed the capacity of the existing Parshall flume. A higher capacity flume will be required in the future for accurate flow measurement.
- **DPMC Detention Time:** Typical HRTs for the design of a DPMC system are on the order of 3.2 and 2.5 days (based on ADWF) in the Complete Mix and Sludge/Settling Basins, respectively. The model results show HRTs of 2.2 days in the Complete Mix Basin and 2.1 days in the Sludge/Settling Basin at the projected ADWF for buildout. The system would be considered overloaded using these guidelines.
- **Tertiary Filters:** The existing filters required a relatively high polymer dose (30 to 60 mg/L) due to the need to remove algae. Additional filtration capacity will be required to accommodate buildout. If filter loading rates cannot be increased, a minimum of five additional filters will be required. If loading rates could be increased to 5 gpm/sf during peak month conditions by providing algae removal prior to filtration, only two additional units would be required. It is assumed that additional backwash pumps will be installed with the new filters to increase the capacity of the backwash pumping station.
- **UV Disinfection:** As shown in Table 12, projected average annual and peak hour flows are expected to exceed the capacity of the existing UV disinfection system. Therefore, this system will require expansion to accommodate the projected buildout flows.
- **Reclaimed Water Pumping Station:** The projected peak hour flows at buildout will exceed the firm capacity of this pumping station. A total of three additional pumps will be required to accommodate buildout.
- **Emergency Storage Basin:** The existing emergency storage basin will provide approximately 1.3 days of storage at buildout, which is lower than the 20-day criteria described in the WDR. However, the District may desire to provide only 24-hours of storage to satisfy the reliability requirements described in Title 22.

Effluent Storage and Disposal

Water balances, reflecting current and buildout treated effluent flows, irrigation demands, and precipitation levels (based on a 100-year rainfall return interval), were developed based on the existing storage and irrigation facilities. The results of these water balances were used to estimate storage and irrigation capacities, assess the impact of reducing the existing storage

pond catchment area from 9.1 to 8.0 acres, and determine the required facilities needed for buildout conditions. A summary of the water balance results is presented in Table 13.

Values presented in the last two columns of Table 13, reflect the number of *additional* ESFUs that can be accommodated by the existing storage and disposal facilities. For example, the existing storage facility has a capacity of 58.5 ac-ft, whereas the current storage required is 64.5 ac-ft, which exceeds the available capacity. The last two columns show that the capacity is exceeded because the number of additional ESFUs that can be added are negative. As shown, the effluent disposal facilities have excess capacity and can accommodate between 36 and 64 additional ESFUs, depending on the flow contribution. If the storage pond catchment area is reduced to 8.0 acres, these facilities can accommodate between 62 and 109 additional ESFUs. Copies of the water balances prepared for this project are provided in Appendix C.

Table 13. Summary of Effluent Storage and Disposal Requirements

Facility and Condition	Estimated Requirements For Current Conditions	Number of Additional ESFUs to Reach Capacity[c]	
		Current Catchment Area (9.1 acres)	Reduced Catchment Area (8.0 acres)
Storage Facility (current capacity of 58.5 ac-ft)			
Current Conditions	64.5 ac-ft [a]	-120 / - 68 ESFUs	-28 / -16 ESFUs
Buildout Conditions	181.2 ac-ft[b]	--	--
Effluent Disposal (current land area of 40 acres)			
Current Conditions	37 acres [a]	64 / 36 ESFUs	109 / 62 ESFUs
Buildout Conditions	135 acres[b]	--	--

[a] Requirements based on the current and buildout ADWFs of 51,400 and 273,00 gpd, respectively and an irrigation rate of 35.9 inches per year.
[b] Based on a total catchment area of 13.5 acres for 2 storage ponds.
[c] Based on the current ADWF contribution of 110 and 195 gpd/ESFU, respectively, for each catchment area scenario.

Current Conditions

The storage facility does not have sufficient capacity to accommodate the current flows being conveyed to the wastewater treatment plant during the 100-year rainfall return interval event. The existing effluent disposal facility has sufficient capacity to accommodate current conditions. The following is a more detailed summary of the capacity assessment for the effluent storage and disposal facilities.

- **Storage Facility:** A total of 64.5 ac-ft of storage is currently required based on the golf course irrigation demand of 35.9 inches per year. As described, current operations limit the net usable storage capacity to 58.5 ac-ft. Comparison of these values shows the existing storage facility is inadequate for current conditions because an additional 6.0 ac-ft is needed. To rectify this situation, the pond levees must be raised by approximately 1 foot or the pump intake must be modified such that the pond volume can be drop below the level corresponding to a volume of 44.6 ac-ft.[9] These

[9] The low-level pond elevation would have to be dropped by roughly 18 inches.

modifications can be substantially reduced if the pond catchment area is reduced by 1.1 acres. This approach will require the pump intake or pond levees to be modified to achieve a volume increase of 2.0 ac-ft (compared to 6.0 ac-ft for the previous approach).

- **Effluent Disposal:** Currently, 37 acres of turf grass is required for effluent disposal at the golf course irrigation rate of 35.9 inches per year. However, 40 acres of application area is available, therefore there is sufficient capacity to accommodate between 36 and 64 additional ESFUs based on the current catchment area. If the catchment area is reduced, between 62 and 109 additional ESFUs can be added without exceeding the irrigation capacity of the golf course.

Buildout Conditions

The storage and disposal facilities require more capacity to accommodate buildout conditions. The following is a summary of the buildout capacity requirements for the effluent storage and disposal facilities:

- **Storage Facility:** Approximately 180 ac-ft of usable storage capacity is required for buildout assuming that the existing storage pond catchment area is reduced to 8.0 acres. Current operations of the storage pond limit the net usable storage capacity to 58.5 ac-ft, so the amount of storage would have be increased by approximately 210 percent to accommodate buildout conditions.
- **Effluent Disposal:** A total of 135 acres (approximately) of irrigable turf grass[10] is required to accommodate buildout conditions. Currently the golf course provides an irrigation area of approximately 40 acres, so the amount of irrigation area would have to be increased approximately 240 percent to accommodate buildout conditions.

Collection, Treatment, Storage, and Disposal Capacities and Required Improvements

Table 14 presents a summary of the estimated treatment, storage, and disposal capacities in terms of ESFUs. As previously described, a total of 470 ESFUs exist currently within the Forest Meadows community. As shown, both the treatment plant and golf course have capacity which exceeds the current flows based on a rate 110 gpd/ESFU, whereas the Storage Pond capacity is not sufficient for existing flows. In the future, as the rates increase to 195 gpd/ESFU, the treatment plant, storage, and disposal capacities will be exceeded, thus requiring expansions to all three of these facilities.

Table 14. Summary of Existing Treatment, Storage, and Disposal Capacities

Facility	Buildout Requirements (ESFUs)	Estimated Capacity (ESFU)	
		110 gpd/ESFU	195 gpd/ESFU
Treatment Plant	1,400	580	475
Storage Pond	1,400	345	195
Golf Course	1,400	530	300

[10] Estimate assumes water demands on new disposal areas are similar to golf course.

Immediate Improvements

The following is a summary of the recommended improvements needed to accommodate the existing 470 ESFUs within the Forest Meadows community. The improvements listed below are based on the current ADWF of 51,400 gpd and a rate of 110 gpd/ESFU. Additional improvements will be required in the future as the wastewater generation rates from the existing connections increase from 110 to 195 gpd/ESFU. Table 15 presents a summary of the estimated treatment, storage, and disposal capacities in terms of ESFUs following the completion of the immediate improvements.

Table 15. Estimated Capacities Following the Completion of the Immediate Improvements

Facility	Estimated Capacity (ESFU)	
	110 gpd/ESFU	195 gpd/ESFU
Treatment Plant	580	475
Storage	575	325
Disposal	575	325

- **Collection System and Lift Stations**
  - None required.
- **Treatment Plant**
  - Install 5 and 1 HP mechanical aerators in the Complete Mix and Settling/Sludge Storage Basins, respectively.
  - Install dissolved air flotation (DAF) thickener units upstream of the tertiary filters for algae removal.
  - The existing Emergency Storage Basin does not satisfy the 20-day storage requirement described in the WDR. The District has initiated a project to address this need.
- **Effluent Storage**
  - A total of 64.5 ac-ft (which exceeds the capacity of the existing storage pond by 6 ac-ft) of storage is required for current conditions. To rectify this situation, the following improvements are required:
    1. The catchment area must be reduced from 9.1 to 8.0 acres by diverting runoff from the hillside immediately southwest of the storage pond.
    2. The pump intake or pond levees must be modified to achieve a volume increase of 2.0 ac-ft.
- **Effluent Disposal**
  - No improvements required to accommodate current conditions.

Improvements Required to Accommodate Growth

The following is a summary of recommended improvements based on the capacity analyses of the existing facilities. The recommendations presented below are based on the assumption that all future flows will be conveyed, treated, stored, and disposed of within the Forest Meadows community. Several, if not all, of these improvements are not necessary if alternative means of treatment, storage, and disposal are implemented as described in Appendix D.

- **Collection System and Lift Stations**
  - **Trunk Sewer 1: T**he District should require the installation of a new trunk sewer in Unit 5 to convey wastewater from this development area directly to Lift Station 2. This trunk sewer could potentially be located near the south boundary of Units 3 and 5, thereby eliminating the need to connect to Trunk Sewer 1 altogether.
  - **Lift Station 2:** The firm capacity of this lift station will be exceeded when the total number of connections in Forest Meadows exceeds 915 ESFUs. Therefore, the two existing pumps should be replaced with larger capacity units, each with a minimum capacity of 640 gpm.
- **Treatment Plant**
  - The existing DPMC system will be overloaded at buildout. Potentially, this system will have to be modified to a higher rate system (i.e. Biolac) to accommodate buildout.
  - If filter-loading rates cannot be increased, a minimum of 5 additional filters will be required. If loading rates can be increased to 5 gpm/sf during peak month conditions, only 2 additional filters will be required.
  - The UV system will require expansion.
  - A total of three additional reclaimed water pumps will be required to accommodate buildout.
  - The Emergency Storage Basin will provide approximately 1.3 days of storage at buildout, which is lower than the 20-day criteria described in the WDR. The District may desire to provide only 24 hours of storage to satisfy the reliability requirements described in Title 22.
- **Effluent Storage Assessment**
  - A total of 181.2 ac-ft of storage is required for buildout. The existing storage pond cannot provide this storage volume. Therefore, a second storage pond (adjacent to the wastewater treatment plant) is required.
- **Effluent Disposal**
  - A total of 135 (useable) acres of irrigable turf grass is required to accommodate buildout conditions. This area requirement is based on an irrigation rate of 35.9 inches per year.

5. Recommended Improvements

The community of Forest Meadows does not have sufficient irrigation sites to accommodate the long-term disposal needs projected for buildout. To provide a long-term plan, two disposal methods were considered in addition to expanding the existing facilities and continuing land disposal within Forest Meadows. A description of these alternatives along with the recommended expansion and financial planning strategy is presented in this section. More detailed information pertaining to these alternatives is presented in Appendix D.

Alternative Disposal Methods and Comparison Results

The following treatment and disposal methods were considered in addition to continued reuse (via irrigation) within Forest Meadows.

- **Maximize Forest Meadows Golf Course Irrigation and Convey Remaining Raw Wastewater to the Murphys Sanitation District.** The overall capacity of the existing Forest Meadows treatment plant, storage pond, and land disposal sites are limited to an ADWF of 63,400 gpd.[11] The objective of this alternative is to maximize the use of existing Forest Meadows facilities and convey raw wastewater flows exceeding this capacity to the Murphys Sanitation District (MSD) for subsequent treatment and disposal. A new force main and gravity pipeline would be required for this alternative. Improvements would also be required at the MSD treatment plant to accommodate the additional ADWF of 209,600 gpd attributed to Forest Meadows at buildout.
- **Golf Course Irrigation Coupled with Wet Season Surface Water Discharge.** Similar to the MSD alternative, the objective of this alternative is to maximize the use of existing Forest Meadows facilities. The overall capacities of the storage pond and land disposal sites are limited to an ADWF of 63,400 gpd. This alternative would require a new outfall pipeline to convey treated effluent to either Angels Creek, San Domingo Creek, or to a nearby surge chamber located along the Collierville Tunnel for subsequent disposal to the Stanislaus River. In all three cases, the new treated effluent pipeline would be designed to accommodate the projected buildout peak hour flow of 640 gpm. In addition, a new effluent lift station would be required for the San Domingo Creek and Stanislaus River options. On an annual basis, approximately 77 percent of the treated effluent flow would be discharged to one of these surface waters. The remaining 23 percent would be used for golf course irrigation.

Collection, treatment, storage, and disposal improvements required for each alternative were identified along with the estimated project costs. Golf course irrigation coupled with seasonal discharge to the Stanislaus River via the Collierville Tunnel was determined to be the recommended long-term disposal strategy. A comparison of the long-term disposal alternatives is provided in Appendix D.

[11] This capacity is based on the assumption that the available storage pond volume dedicated to storage of treated effluent is increased from 58.4 to 66.3 ac-ft and the catchment area is reduced from 9.1 to 8.0 acres.

Recommended Long-Range Disposal Strategy

The recommended long-range disposal strategy includes the following components and specific tasks:

- **Immediate Improvements and Compliance Related Tasks**
  - **Emergency Storage.** Submit a report that describes the treatment plant's emergency storage and disposal strategy and reliability features required by the WDR and CAO. It is recommended that the District implement the short-term (minimum 24-hour) storage option, and provide redundant equipment to satisfy these reliability requirements described in Article 10, Section 60431 of "The Purple Book."[12]

    The District has initiated this project. The draft report is scheduled to be completed in September 2004.
  - **Compliance Improvements.** The objective of this project is to bring the wastewater facilities into compliance with current regulations. The following is a summary of the recommended improvements:

    3. Install 5 and 1 HP mechanical aerators in the Complete Mix and Settling/Sludge Storage Basins, respectively, for redundancy.
    4. Install, two, 65 sf dissolved air flotation (DAF) thickener units upstream of the tertiary filters for algae removal.
    5. Increase the effluent storage capacity by:
       a. Reducing the catchment area from 9.1 to 8.0 acres by diverting rainfall runoff from the hillside immediately southwest of the storage pond. This improvement will reduce the required storage volume from 64.5 to 60.1 ac-ft.
       b. Modifying the pump intake or increasing the height of the pond levees to achieve a volume increase of 2.0 ac-ft.

    The total estimated project cost for these improvements is $850,000. Approximately $295,000 of this projected cost is for future ESFUs.

    The improvements listed above are based on the current ADWF of 51,400 gpd and a rate of 110 gpd/ESFU. Additional improvements will be required in the future as the wastewater generation rates from the existing connections increase from 110 to 195 gpd/ESFU. Table 16 presents a summary of the estimated treatment, storage, and disposal capacities in terms of ESFUs following the completion of this project.

[12] California Health Laws Related to Recycled Water, June 2001.

Table 16. Estimated Capacities Following the Completion of the Compliance Improvements

Facility	Estimated Capacity (ESFU)	
	110 gpd/ESFU	195 gpd/ESFU
Treatment Plant	580	475
Storage Pond	575	325
Disposal (Golf Course)	575	325

- **Title 22 Engineering Report.** Submit an engineering report in accordance with the *Guidelines for the Preparation of an Engineering Report for the Production, Distribution, and Use of Recycled Water* (Department of Health Services, March 2001) to the RWQCB and DHS.

  The District has initiated this project. The draft report is scheduled to be completed in September 2004.

◆ **Long-Range Planning Improvements**

- **Interim Connection Limits:** Allowing a maximum of 20 new ESFUs per year to connect to the existing wastewater facilities for the next two years. Complete Phase 1 of the long-range planning improvements within this two-year time period.
- **Report of Waste Discharge:** Gathering effluent and receiving water quality data required to obtain a surface water discharge permit.[13] Request a seasonal discharge permit for the Stanislaus River when the current WDR is renewed.
- **Phase 1 Improvements:** The objective of this project is to provide collection system improvements, increase the rated capacity of the existing wastewater treatment plant, and install the facilities required for discharging to the Stanislaus River. These improvements will expand the system capacity to 810 ESFUs. The overall capacity is limited by the DAF units. The following is a summary of the recommended Phase 1 improvements:

  1. Replace the existing pumps in Lift Station 2 with higher capacity units, each having a minimum rated capacity of 640 gpm.
  2. Add one additional continuous backwash tertiary filter with a minimum rated capacity of 95 gpm.
  3. Upgrade the UV system to provide a minimum peak flow capacity of 640 gpm.
  4. Install an export lift station and outfall pipeline with a minimum firm capacity of 640 gpm to convey treated effluent to the Collierville Tunnel for subsequent discharge to the Stanislaus River.

[13] The District has initiated this project. The last phase of water quality sampling is schedule to be completed September 2005.

The total estimated project cost for these improvements is $3,590,000. As described above, the Phase 1 improvements should be in service in 2006.

- **Phase 2 Improvements:** This project will increase the rated capacity of the DAF units by adding a third unit and increase the system capacity to 1,125 ESFUs. The total estimated project cost for this improvement is $295,000. This new unit should be in service by 2014 to accommodate future flows.
- **Phase 3 Improvements:** This project will increase the rated capacity of the wastewater system to 1,400 ESFU. The following is a summary of the recommended Phase 3 improvements:

  1. Converting the existing secondary treatment system to an extended aeration activated sludge system
  2. Installing two, 30-ft diameter clarifiers.
  3. Installing one additional continuous backwash tertiary filter with a minimum rated capacity of 65 gpm.

  The total estimated project cost for these improvements is $1,475,000. These improvements should be in service by 2020 to accommodate future flows.

6. References

County Sanitation District of Sacramento County, California, April 2002. *Sanitary Trunk Sewer Design Manual.*

Dames & Moore Company, December 1997, *Forest Meadows Wastewater Treatment Plant, Land Disposal Option Investigation*.

Department of Health Services, March 2001. *Guidelines for the Preparation of an Engineering Report for the Production, Distribution, and Use of Recycled Water*.

Department of Health Services, June 2001.*California Health Laws Related to Recycled Water: "The Purple Book."* Excerpts from the Health and Safety Code, Water Code, and Titles 22 and 17 of the California Code of Regulations.

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Papais, Lou, January 1, 2003. *Letter pertaining to projected Forest Meadows growth.*

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Taber, July 2001. *Geotechnical Investigation, Forest Meadows Dam*, prepared for James C. Hanson.

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West Yost & Associates, July 1993. *Forest Meadows Wastewater Facility Expansion Study*.

APPENDIX A

WASTE DISCHARGE REQUIREMENTS

Appendix A

Winston H. Hickox
Secretary for Environmental Protection

California Regional Water Quality Control Board
Central Valley Region
Robert Schneider, Chair

Gray Davis
Governor

Sacramento Main Office
Internet Address: http://www.swrcb.ca.gov/rwqcb5
3443 Routier Road, Suite A, Sacramento, California 95827-3003
Phone (916) 255-3000 • FAX (916) 255-3015

10 October 2002

Mr. John Stewart, District Manager
Calaveras County Water District
423 East St. Charles Street
P.O. Box 846
San Andreas, CA 95249

Mr. Lou Papais
Alston Financial, Inc./EMC, Inc.
P.O. Box 70
Murphys, CA 95247

NOTICE OF VIOLATION AND INSPECTION REPORT, CALAVERAS COUNTY WATER DISTRICT, ALSTON FINANCIAL, INC. AND EMC, INC., FOREST MEADOWS WASTEWATER TREATMENT AND RECLAMATION PLANT, CALAVERAS COUNTY

Waste Discharge Requirements (WDRs) Order No. 5-00-066, adopted by the Regional Board on 17 March 2000, prescribes requirements for the collection, treatment, and storage of wastewater and the subsequent reclamation on the Forest Meadows Golf Course. Enclosed for your records is a copy of the inspection report and photographs that were taken during the inspection of the Forest Meadows Golf Course on 19 September 2002. As described in the report, staff observed numerous violations of the WDRs.

In particular, the Forest Meadows Golf Course has violated WDRs Order No. 5-00-066 as specified below:

1) Discharge Prohibition A.1 states "*Discharge of wastes to surface waters or surface water drainage courses is prohibited*." There are several ponds and numerous surface drainage courses located throughout the golf course. Rainfall runoff flows through the surface water drainage courses and fills the ponds during winter months. There was evidence of irrigation runoff and/or over spray into the ponds located adjacent to fairway number 3, 8, 17, and 18. In addition, there was evidence of reclaimed water over sprayed into surface water drainage courses adjacent to golf course fairways and greens and into surface water drainage courses that cross some of the fairways.

2) Reclamation Requirements D.3 states "*Reclaimed wastewater conveyance lines shall be clearly marked as such*." The irrigation pump station located adjacent to the effluent storage pond was not labeled.

3) Reclamation Requirements D.4 states " *Reclaimed water controllers, valves, etc. shall be affixed with reclaimed water warning signs, and these and quick couplers and sprinkler heads shall be of a type, or secured in a manner, that permits operation by authorized personnel only*."

Sprinkler heads, quick connect couplers, and valve boxes were not properly labeled and marked.

During the inspection, the golf course superintendent stated that the sand traps located throughout the golf course had underdrains but most of them were not working. The superintendent was not sure where the underdrains drained too. If it is determined that the underdrains discharge to surface water drainage courses, then the drains must be redirected, such that wastewater will not enter any surface water drainage courses.

Title 22 of the California Code of Regulations requires that all reclaimed water irrigation pipe located underground be painted purple, so as to ensure that cross connections with potable water supplies do not occur. During the inspection, the golf course maintenance superintended stated that none of the irrigation pipe was painted purple. Staff discussed this issue with Mr. Joseph Spano of the Department of Health Services, Division of Drinking Water. Mr. Spano stated that his Department would not require the Forest Meadows Golf Course to retrofit the underground irrigation piping system to comply with the purple pipe requirement. However, Mr. Spano did state that the golf course must clearly label, mark (with purple paint), all above ground reclaimed water distribution apparatus, including water controllers, valves, sprinkler heads, and quick coupler fittings.

By **15 November 2002**, please submit a report describing the corrective measures you have taken, or propose to take, to address the violations noted above. The report must include proposed timelines for coming into compliance with WDRs Order No. 5-00-066 and Title 22.

Please be aware that the observed violations are very serious and continued failure to comply with the conditions of your WDRs may result in additional enforcement actions.

If you have any questions regarding this letter, please telephone Scott Kranhold at (916) 255-3389.

WENDY WYELS, Chief
Waste Discharge to Land Unit
Lower San Joaquin River Watershed

Encl: Inspection Report and Photographs

cc: w/encl Brian Moss, Calaveras County Environmental Health Department, San Andreas
Fred Burnett, Calaveras County Water District, San Andreas
Bill Perly, Calaveras County Water District, San Andreas
Jeff Olson, Forest Meadows Golf Course, Murphys

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. 5-00-066

WASTE DISCHARGE REQUIREMENTS
FOR
FOREST MEADOWS WASTEWATER TREATMENT AND RECLAMATION PLANT
CALAVERAS COUNTY WATER DISTRICT
ALSTON FINANCIAL, INC. AND EMC, INC.
CALAVERAS COUNTY

The California Regional Water Quality Control Board, Central Valley Region (hereafter Board), finds that:

1. The Calaveras County Water District (CCWD) submitted a Report of Waste Discharge (RWD), dated 18 June 1999, for the upgraded Forest Meadows wastewater treatment and reclamation plant (Plant). The Plant is located approximately two miles east of the town of Murphys. The Plant and majority of the property on which the Plant is located (Assessor's Parcel No. 34-052-03) is owned by CCWD. The remainder of the property on which the Plant is located, and the property which contains the leachfields (APN 34-052-02), is owned by EMC, Inc.

2. The Plant is located on Forest Meadows Road off Highway 4. It is situated on the north side of Angels Creek in Section 34, T4N, R14E, MDB&M with surface water drainage to Angels Creek, as shown in Attachment A, which is attached hereto and made part of this Order by reference.

3. Waste Discharge Requirements Order No. 74-326, adopted by the Board on 24 May 1974, prescribes requirements for discharge of treated domestic wastewater from the Plant to a community leachfield. Order No. 74-326 is neither adequate nor consistent with current plans and policies of the Board.

4. The former Plant design consisted of headworks facilities, two aerated ponds, a storage pond, an effluent pump station, and two leachfields designed for 30,000 gallons per day (gpd) each. The rated capacity of the Plant was 65,000 gpd. However, seepage has been observed below each of the leach fields at application rates greater than approximately 40,000 gpd.

5. According to Monitoring Reports submitted by CCWD, the current average daily discharge covering the dry months from May through October is 43,000 gpd. For the wet months of November through March, the average daily discharge is 62,400 gpd. Flows range from a low of approximately 28,000 gpd, during the dry season, to a high of approximately 193,000 gpd during the peak-wet season.

6. CCWD proposes to expand the treatment capacity of the Plant and to upgrade the treatment processes to provide reclaimed wastewater to the Forest Meadows Golf Course for

irrigation. Reclaimed wastewater will be discharged from the Plant to a 108 acre-foot impoundment (Storage Facility). The Storage Facility is located approximately 1800-feet from the Plant.

7. The Storage Facility (APN 34-052-18) and the Forest Meadow Golf Course (APN 34-075-01) are owned by Alston Financial, Inc. The Calaveras County Water District, Alston Financial Inc., and EMC Inc., are hereby jointly referred to as "Discharger". All three entities are jointly responsible for ensuring compliance with these waste discharge requirements.

8. CCWD has entered into an April 1999 "*Effluent Storage and Disposal Agreement* " (Agreement) with Alston Financial, Inc. The purpose of the Agreement is to provide for storage and long-term utilization of reclaimed wastewater at the Forest Meadows Golf Course. The terms and conditions of the Agreement, which are specifically set forth in CCWD's Resolution No. 98-40, state, in pertinent part, the following:

   "Spray irrigation of effluent shall be accomplished in compliance with the applicable waste discharge permit(s)."

9. Plant upgrades consist of the following: The two aerated ponds have been converted to a complete mix basin and a sludge-settling storage basin, effluent from the sludge-settling basin will be filtered with two continuous backwash, deep-bed sand filters, and effluent from the sand filters will be disinfected by an ultraviolet (UV) light contact-chamber. Depending on the operational efficiency of the wastewater treatment system, the Discharger may install a clarification unit (DAF – dissolved air flotation) at a later date. Reclaimed wastewater will then be pumped to the golf course and stored for irrigation in the 108 acre-foot impoundment. The existing leach fields will be retained for emergency use to prevent spills from the Storage Facility during storm events or when Plant effluent does not meet Title 22 California Code of Regulation (CCR) standards. However, in no event shall the volume of wastewater disposed to the leachfields exceed the volume set forth in Discharge Specification B.3.

10. The reclamation Plant is designed to treat average dry weather flows up to 190,000 gpd and peak wet weather flows up to 280,000 gpd.

11. Reclamation effluent limits are based on the State Department of Health Services statewide reclamation criteria contained in Title 22, California Code of Regulations, Section 60301, et seq. (hereafter Title 22), which provide guidelines for the use of reclaimed water onto parks, playgrounds, schoolyards and other areas where the public has similar access or exposure.

12. Surrounding land uses are primarily rural residential with no industrial zoning in the project area.

13. The Board adopted a Water Quality Control Plan, Fourth Edition, for the Sacramento River and San Joaquin River Basins (hereafter Basin Plan), which contains water quality objectives for waters of the Basins. These requirements implement the Basin Plan.

14. Surface water runoff is to Angels Creek, a tributary to the New Melones Reservoir, which eventually empties to the Stanislaus River.

15. The beneficial uses of downstream waters from the Plant are municipal and domestic supply; agricultural supply; recreation; aesthetic enjoyment; groundwater recharge; fresh water replenishment; and preservation and enhancement of fish, wildlife, and other aquatic resources.

16. The beneficial uses of underlying groundwaters are municipal, industrial, and agricultural supply.

17. On 12 August 1998, CCWD certified an Initial Study/Mitigated Negative Declaration in accordance with the California Environmental Quality Act (CEQA) (Public Resources Code Section 21000, et seq.) and the State CEQA Guidelines. The Project as approved will not have a significant effect on water quality.

18. The Board has reviewed the Initial Study/Mitigated Negative Declaration and concurs that the Project as approved will not have significant impacts on water quality.

19. The Board consulted with the State Department of Health Services and the Calaveras County Health Department and considered their recommendations regarding public health aspects for the use of reclaimed water.

20. This discharge is exempt from the requirements of *Consolidated Regulations for Treatment, Storage, Processing, or Disposal of Solid Waste,* as set forth in Title 27, CCR, Division 2, Subdivision 1, Section 2005, et seq., (hereafter Title 27). The exemption pursuant to Section 20090(b), is based on the following:

    a. The Board is issuing waste discharge requirements,
    b. The discharge complies with the Basin Plan, and
    c. The wastewater does not need to be managed according to Title 22 CCR, Division 4.5, and Chapter 11, as a hazardous waste.

21. The Board has notified the Discharger, and interested agencies and persons of its intent to prescribe waste discharge requirements for this discharge and has provided them with an opportunity for a public hearing and an opportunity to submit their written views and recommendations.

22. The Board, in a public meeting, heard and considered all comments pertaining to the discharge.

IT IS HEREBY ORDERED that Order No. 74-326 is rescinded and the Calaveras County Water District, Alston Financial, Inc., and EMC, Inc., their agents, successors, and assigns, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted thereunder, shall comply with the following:

A. Discharge Prohibitions:

1. Discharge of wastes to surface waters or surface water drainage courses is prohibited.

2. Bypass or overflow of untreated or partially treated waste is prohibited.

3. Neither the treatment nor the discharge shall cause a nuisance or condition of pollution as defined by the California Water Code, Section 13050.

4. The discharge shall not cause the degradation of any water supply.

5. Discharge of waste classified as hazardous, as defined in Sections 2521(a) of Title 23, CCR, Section 2510, et seq., (hereafter Chapter 15, or 'designated', as defined in Section 13173 of the California Water Code, is prohibited.

6. Excessive irrigation with reclaimed water that results in excessive runoff of reclaimed water, or continued irrigation of reclaimed water during periods of precipitation, is prohibited.

7. Surfacing of wastewater in the leachfields is prohibited.

B. Discharge Specifications:

1. The average dry weather discharge flow rate shall not exceed 0.19 mgd.

2. The peak wet weather discharge flow rate shall not exceed 0.28 mgd.

3. The discharge flow to the leachfields shall not exceed the capacity of the leachfields (as determined by the report submitted per Provisions F.1). The leachfields shall have sufficient capacity to accommodate allowable wastewater flow as well as inflow and infiltration during the wet season.

4. The existing leachfield area will serve as a long-term Plant reliability feature. Wastewater disposal to the leachfields is permitted during periods of Plant repair, to prevent spillage at the Storage Facility, and when treated wastewater effluent does not

meet Title 22 CCR standards. Pursuant to Title 22 CCR, Section 60341(b), the leachfields shall be of sufficient capacity to provide for at least 20 days of emergency disposal capacity. The Plant may incorporate the use of the on-site emergency storage basin to meet the 20-day emergency disposal requirement.

5. The Plant and the Storage Facility shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return frequency.

6. The Forest Meadows Storage Facility shall have sufficient capacity to contain all reclaimed wastewater flow, design seasonal precipitation, seasonal ancillary inflow, and infiltration during the wet season. Design seasonal precipitation shall be based on total annual precipitation using a return of 100 years, distributed monthly in accordance with historical rainfall patterns.

7. The freeboard in all ponds (at the Plant and Storage Facility) shall never be less than two feet as measured vertically from the water surface to the upper surface of the lowest adjacent dike or levee.

8. On or about **15 October** each year, the available Storage Facility capacity shall at least equal the volume necessary to comply with Discharge Specification Nos. 6 and 7.

9. Objectionable odors originating at the Plant or Storage Facility shall not be perceivable beyond the boundaries of the Plant or Storage Facility.

10. As a means of discerning compliance with Discharge Specification No. 9, the dissolved oxygen content shall not be less than 1.0 mg/l in the Storage Facility, as measured at a point at as far as practical from the inlet and within one foot of the water surface.

11. Public contact with reclaimed wastewater shall be precluded through such means as fences, signs, and other acceptable alternatives.

C. Effluent Limitations:

1. The discharge to the Storage Facility of an effluent in excess of the following limits is prohibited:

Constituent	Units	Monthly Average	Daily Maximum	Weekly Median	Daily Average
Total Coliform Organisms	MPN/100 ml	-	23	2.2	-

Constituent	Units	Monthly Average	Daily Maximum	Weekly Median	Daily Average
Settleable Solids	ml/l	0.2	0.5	-	-
BOD[1]	mg/l	20	30	-	-
Turbidity	NTU	-	-	-	2[2]

[1] 5-Day, 20° Celsius Biochemical Oxygen Demand
[2] Not to exceed 5 NTU more that 5% of the time during a 24-hour period.

D. Reclamation Requirements:

1. Reclaimed wastewater shall meet the criteria contained in Title 22, Division 4, CCR (Section 60301, et seq.).

2. Reclaimed wastewater shall be discharged to the Forest Meadows Golf Course in accordance with a Wastewater Disposal Operations Plan to be submitted to the Executive Officer for approval.

3. Reclaimed wastewater conveyance lines shall be clearly marked as such.

4. Reclaimed water controllers, valves, etc., shall be affixed with reclaimed water warning signs, and these and quick couplers and sprinkler heads shall be of a type, or secured in a manner, that permits operation by authorized personnel only.

5. Areas irrigated with reclaimed water shall be managed to prevent breeding of mosquitoes. More specifically,

   a. All applied irrigation water must infiltrate completely within a 12-hour period.

   b. Ditches not serving as wildlife habitat should be maintained free of emergent, marginal, and floating vegetation.

   c. Low-pressure and un-pressurized pipelines and ditches accessible to mosquitoes shall not be used to store reclaimed water.

6. Reclaimed water for irrigation shall be managed to minimize erosion, and runoff from the disposal area.

7. Direct or windblown spray shall be confined to the designated reclamation area and prevented from contacting drinking water facilities.

8. The Discharger may not irrigate with effluent during periods of precipitation and for at least 24 hours after cessation of precipitation, or spray irrigate when wind velocities exceed 30 mph.

9. Signs with proper wording of sufficient size shall be placed at areas of access and around the perimeter of all areas used for effluent disposal to alert the public of the use of reclaimed water.

10. Runoff from the irrigation field shall not be discharged to any surface water drainage course within 24 hours of the last application of reclaimed water.

11. There shall be no impoundment of reclaimed water within 50 feet of any domestic water well or irrigation well unless it is demonstrated to the satisfaction of the Executive Officer that a shorter distance is justified.

E. Solids Disposal Requirements:

1. Collected screenings, sludge, and other solids removed from liquid wastes shall be disposed of in a manner approved by the Executive Officer, and consistent with *Consolidated Regulations for Treatment, Storage, Processing, or Disposal of Solid Waste,* as set forth in Title 27, CCR, Division 2, Subdivision 1, Section 20005, et seq.

2. Any proposed change in sludge use or disposal practice from a previously approved practice shall be reported to the Executive Officer and U.S. Environmental Protection Agency (EPA) Regional Administrator at least 90 days in advance of the change.

3. Use and disposal of sewage sludge shall comply with existing Federal, State, and local laws and regulations, including permitting requirements and technical standards included in 40 CFR 503.

4. If the State Water Resources Control Board and the Regional Water Resources Control Board are given the authority to implement regulations contained in 40 CFR 503, this Order may be reopened to incorporate appropriate time schedules and technical standards. CCWD shall comply with the standards and time schedules contained in 40 CFR 503 whether or not they have been incorporated into this Order.

F. Groundwater Limitations:

1. The discharge, in combination with other sources, shall not cause underlying groundwater to contain waste constituents in concentration statistically greater than background water quality, except for Coliform bacteria. For coliform bacteria, increases shall not cause the most probable number of total coliform organisms to exceed 2.2 MPN/100 ml over any 7-day period.

G. Provisions:

1. By **25 April 2000**, the Discharger shall submit a report prepared and signed by a registered engineer which evaluates the available disposal capacity of the existing leachfield system, determines whether the capacity of the leachfield will need to be increased to be in compliance with Prohibition A. 7, and Discharge Specification B. 4, and provides design plans, if necessary, to increase the capacity of the existing leachfield. If the existing leachfields will not meet the requirements of Prohibition A. 7, Discharge Specification B. 4, then the Discharger must provide design plans for the construction of new leachfields.

2. By **25 July 2000**, the Discharger shall provide a report prepared and signed by a registered engineer that certifies the Plant has increased the available leachfield disposal capacity, if necessary as determined by Provision F. 1.

3. By **25 October 2000**, the Discharger shall provide a report prepared and signed by a registered engineer that certifies the Plant has increased the available leachfield disposal capacity by the construction of new leachfields, if necessary as determined by Provision F. 1.

4. By **1 May 2000**, the Discharger shall submit a Wastewater Disposal Operations Plan that describes in detail how, when, and where wastewater will be applied to the golf course.

5. By **1 May 2000**, the Discharger shall submit written verification of compliance with Provision G. 13, including a copy of each operator's certification.

6. By **1 September 2000**, the Discharger shall submit a comprehensive water balance analysis to determine compliance with Discharge Specifications B.4 and B.5. Total annual precipitation shall be based on a return period of 100 years, distributed monthly in accordance with historical rainfall patterns. If insufficient volume is available, then the report shall also contain a plan and time schedule for coming into full compliance with this Order.

7. By **1 October 2000**, the Discharger shall submit a Solids Management Plan for the permanent disposal of biosolids, the long-term management of biosolids, and for all other non-effluent wastes generated by the treatment process**.** The Solids Management Plan shall provide a detailed program and schedule for permanent disposal of all solid wastes that will be generated in the future. Information provided shall include methods and locations of temporary on-site storage (if used), Best Management Practices for on-site handling and storage of solid waste, means of disposal, frequency of disposal, and disposal site (as applicable).

8. At least 90 days prior to termination or expiration of any lease, contract, or agreement involving the disposal or reclamation areas, used to justify the capacity authorized herein and assure compliance with this Order, the Discharger shall notify the Board in writing of the situation and of what measures have been taken or are being taken to assure full compliance with this Order.

9. The Discharger shall comply with Monitoring and Reporting Program No. 5-00-066, which is part of this Order, and any revisions thereto, as ordered by the Executive Officer.

10. The Discharger shall comply with the "Standard Provisions and Reporting Requirements for Waste Discharge Requirements", dated 1 March 1991, which is attached hereto and made part of this Order by reference. This attachment and its individual paragraphs are commonly referenced as "Standard Provision(s)".

11. The Discharger shall submit to the Board on or before each compliance report due date the specified document, or if appropriate, a written report detailing compliance or noncompliance with the specific schedule date and task. If noncompliance is reported, then the Discharger shall state the reasons for noncompliance and shall provide a schedule to come into compliance.

12. The Discharger shall use the best practicable cost-effective control technique(s) currently available to comply with discharge limits specified in this order.

13. The Discharger shall provide certified wastewater treatment plant operators in accordance with Title 23 of the California Code of Regulations, Division 3, Chapter 26.

14. The Discharger shall report promptly to the Board any material change or proposed change in the character, location, or volume of the discharge.

15. In the event of any change in control or ownership of land or waste discharge facilities presently owned or controlled by CCWD, Alston Financial, Inc., or EMC, Inc., then the party shall notify the succeeding owner or operator of the existence of this Order by letter, a copy of which shall be forwarded to this office.

16. CCWD, Alston Financial, Inc., and EMC, Inc., shall comply with all conditions of this Order, including timely submittal of technical and monitoring reports as directed by the Executive Officer. Violations may result in enforcement action, including Regional Board or court orders requiring corrective action or imposing civil monetary liability, or in revision or rescission of this Order.

17. A copy of this Order shall be kept at the discharge facility for operating personnel. Key operating personnel shall be familiar with its contents.

18. The Board will review this Order periodically and may revise requirements when necessary.

I, GARY M. CARLTON, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of an Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on 17 March 2000.

_____

GARY M. CARLTON, Executive Officer

Attachments

DLM: 3/17/00

INFORMATION SHEET

ORDER NO. 5-00-066
FOREST MEADOWS WASTEWATER TREATMENT AND RECLAMATION PLANT
CALAVERAS COUNTY WATER DISTRICT
ALSTON FINANCIAL, INC., AND EMC, INC.
CALAVERAS COUNTY

The Calaveras County Water District (CCWD) owns and operates the Forest Meadows Wastewater Treatment Plant (Plant) that serves the existing community of Forest Meadows. Forest Meadows is located approximately 2 miles from the town of Murphys. CCWD is in the process of upgrading the Plant to provide reclaimed wastewater for irrigation at the Forest Meadows Golf Course. The Plant is designed to meet State Department of Health Services criteria for reclamation of wastewater for golf course irrigation.

The Plant wastewater treatment process consists of a complete mix basin and a sludge-settling storage basin, effluent from the sludge-settling basin will be filtered with two continuous backwash, deep-bed sand filters, and effluent from the sand filters will be disinfected by an ultraviolet (UV) light contact-chamber. Reclaimed wastewater will be pumped to the golf course and stored for irrigation in a 108-acre foot impoundment, the Forest Meadows Storage Facility. The existing leachfields will be retained for emergency use during periods of necessary Plant repair, to prevent spillage at the Storage Facility, and for necessary disposal when Plant effluent does not meet Title 22 CCR standards.

The Report of Waste Discharge, dated 18 June 1999, indicated that the Plant's treatment capacity is approximately 0.28 million gallons per day (mgd). The proposed WDRs prohibit the monthly average daily discharge flow from exceeding 0.28 mgd.

Reclaimed wastewater will only be used for irrigation at the Forest Meadows Golf Course. Reclaimed wastewater effluent limits are based on the State Department of Health Services statewide reclamation criteria contained in Title 22, California Code of Regulations, Section 60301, et seq., which provide guidelines for the unrestricted use of reclaimed water onto parks, playgrounds, schoolyards, and other areas where the public has similar access for exposure.

CCWD has certified an Initial Study/Mitigated Negative Declaration in accordance with the California Environmental Quality Act (CEQA) (Public Resources Code Section 21000, et seq.) and State CEQA Guidelines. The Board has reviewed the Initial Study/Mitigated Negative Declaration and concurs that the project as approved will not have significant impacts on water quality.

Surface water drainage is to Angels Creek which is a tributary to the New Melones Reservoir.

Appendix B

Collection System Evaluation

Forest Meadows Wastewater Treatment Facility Master Plan (Contract Amendment 2)
Calaveras County Water District

Conveyance System Capacity Evaluation

Current Flow

Average WW production per ESFU = 109 gpd
Peak Hour and I/I flow per ESFU = 436 gpd
Mannings n = 0.009
Maximum Depth Criteria (d/D) = 0.5 D ≤ 6 inch
= 0.67 D > 6 inch

Trunk Sewer	Upstream Manhole Station	Upstream Manhole Invert Elevation (ft)	Downstream Manhole Station	Downstream Manhole Invert Elevation (ft)	Pipe Size (in)	Pipe Length (ft)	Cumulative Pipe Length (ft)	# of ESFUs upstream of upstream MH	Avg Daily Flow (cfs)	Peak Hour Flow (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Water Flowing Down Hill?	Pipe Slope (ft/ft)	Manning *n* Value	Minimum Design Flow Depth (in)	Maximum Design Flow Depth (in)	Flow Depth Critera Met?	VELOCITY TEST: Minimum Design Flow Velocity (ft/s)	VELOCITY TEST: Maximum Design Flow Velocity (ft/s)	PIPE DEPTH TEST: Flow Velocity Critera Met?(Min. Velocity)	PIPE DEPTH TEST: Flow Velocity Critera Met?(Max. Velocity)
1a	MH59D	3526.2	MH59A	3433.5	6	920	920	13	0.00	0.01	3526.2	3433.50	yes	0.1008	0.009	0.1	0.2	yes	2.106496	3.219286	yes	yes
	MH59A	3433.5	MH58	3430.5	6	600	1520	21	0.00	0.01	3433.50	3430.50	yes	0.0050	0.009	0.3	0.6	yes	0.805457	1.254353	**no**	yes
	MH58	3430.5	MH57	3428.5	6	400	1920	26	0.00	0.02	3430.50	3428.50	yes	0.0050	0.009	0.4	0.7	yes	0.903481	1.334748	**no**	yes
	MH57	3428.5	MH55	3424.75	6	750	2670	39	0.01	0.03	3428.50	3424.75	yes	0.0050	0.009	0.5	0.9	yes	0.965384	1.481965	**no**	yes
	MH55	3424.75	MH81C	3422.6	6	430	3100	43	0.01	0.03	3424.75	3422.60	yes	0.0050	0.009	0.5	0.9	yes	0.98874	1.515412	**no**	yes
	MH81C	3422.6	MH81B	3421.6	6	200	3300	79	0.01	0.05	3422.60	3421.60	yes	0.0050	0.009	0.6	1.2	yes	1.179689	1.848762	yes	yes
	MH81B	3421.6	MH81	3419.45	6	430	3730	90	0.02	0.06	3421.60	3419.45	yes	0.0050	0.009	0.7	1.3	yes	1.275477	1.896859	yes	yes
	MH81	3419.45	MH71	3414.55	6	980	4710	96	0.02	0.06	3419.45	3414.55	yes	0.0050	0.009	0.7	1.4	yes	1.293583	1.925746	yes	yes
	MH71	3414.55	MH101	3331.57	6	1050	5760	107	0.02	0.07	3414.55	3331.57	yes	0.0790	0.009	0.4	0.7	yes	3.389732	5.240272	yes	yes
	MH101	3331.57	MH102	3327.97	6	950	6710	114	0.02	0.08	3331.57	3327.97	yes	0.0038	0.009	0.8	1.6	yes	1.222473	1.83029	yes	yes
	MH102	3327.97	MH105	3302.32	6	970	7680	125	0.02	0.08	3327.97	3302.32	yes	0.0264	0.009	0.5	1.0	yes	2.506071	3.832003	yes	yes
	MH105	3302.32	MH107	3272.05	6	800	8480	125	0.02	0.08	3302.32	3272.05	yes	0.0378	0.009	0.5	0.9	yes	2.874244	4.248702	yes	yes
1b	MH107	3272.05	MH265	3250.38	6	210	8690	141	0.02	0.10	3272.05	3250.38	yes	0.1032	0.009	0.4	0.8	yes	4.094786	6.312646	yes	yes
	MH265	3250.38	MH264	3230	6	310	9000	150	0.03	0.10	3250.38	3230.00	yes	0.0657	0.009	0.5	0.9	yes	3.713014	5.486414	yes	yes
1c	MH264	3230	MH262	3189.08	8	810	9810	153	0.03	0.10	3230.00	3189.08	yes	0.0505	0.009	0.5	0.9	yes	3.174972	4.903962	yes	yes
	MH262	3189.08	MH260	3169.18	8	200	10010	153	0.03	0.10	3189.08	3169.18	yes	0.0995	0.009	0.4	0.8	yes	3.932631	6.127995	yes	yes
	MH260	3169.18	MH259	3159.42	8	380	10390	153	0.03	0.10	3169.18	3159.42	yes	0.0257	0.009	0.5	1.1	yes	2.523048	3.786201	yes	yes
	MH259	3159.42	Wet Well	3157.5	8	320	10710	156	0.10	0.11	3159.42	3157.50	yes	0.0060	0.009	1.5	1.5	yes	2.258077	2.305762	yes	yes
2a	MH38	3267.5	MH6	3264.4	6	620	620	8	0.00	0.01	3267.50	3264.40	yes	0.0050	0.009	0.2	0.4	yes	0.574689	0.929313	**no**	yes
	MH6	3264.4	MH5	3262.9	6	300	920	13	0.00	0.01	3264.40	3262.90	yes	0.0050	0.009	0.3	0.5	yes	0.703128	1.042526	**no**	yes
	MH5	3262.9	MH2	3257.55	6	1070	1990	32	0.01	0.02	3262.90	3257.55	yes	0.0050	0.009	0.4	0.8	yes	0.929313	1.372601	**no**	yes
	MH2	3257.55	MH1	3256.05	6	300	2290	65	0.01	0.04	3257.55	3256.05	yes	0.0050	0.009	0.6	1.1	yes	1.14983	1.703914	yes	yes
	MH1	3256.05	MH114	3250.75	6	1060	3350	124	0.02	0.08	3256.05	3250.75	yes	0.0050	0.009	0.8	1.6	yes	1.387887	2.075427	yes	yes
	MH114	3250.75	MH116	3201.04	6	580	3930	132	0.02	0.09	3250.75	3201.04	yes	0.0857	0.009	0.4	0.8	yes	3.833417	5.909711	yes	yes
	MH116	3201.04	MH112	3200.5	6	150	4080	161	0.03	0.11	3201.04	3200.50	yes	0.0036	0.009	1.0	1.9	yes	1.320671	1.995934	yes	yes
2b	MH112	3200.5	MH117	3193.86	6	460	4540	178	0.03	0.12	3200.50	3193.86	yes	0.0144	0.009	0.7	1.4	yes	2.284472	3.404488	yes	yes
	MH117	3193.86	MH118	3173.4	6	470	5010	178	0.03	0.12	3193.86	3173.40	yes	0.0435	0.009	0.5	1.1	yes	3.347583	4.957059	yes	yes
	MH118	3173.4	PS #2	3162.5	6	480	5490	209	0.04	0.14	3173.40	3162.50	yes	0.0227	0.009	0.7	1.4	yes	2.816238	4.192509	yes	yes
3a	MH31	3320.3	MH29	3319.965	6	67	9	9	0.00	0.01	3323.93	3323.53	yes	0.0060	0.009	0.2	0.4	yes	0.646525	1.045477	**no**	yes
	MH29	3319.965	MH27	3315.965	6	800	809	20	0.00	0.01	3323.53	3318.73	yes	0.0060	0.009	0.3	0.6	yes	0.85277	1.261257	**no**	yes
	MH27	3315.965	MH24	3313.315	6	530	1339	29	0.00	0.02	3318.73	3315.55	yes	0.0060	0.009	0.4	0.7	yes	0.918712	1.420261	**no**	yes
	MH24	3313.315	MH12	3310.565	6	550	1889	45	0.01	0.03	3315.55	3312.25	yes	0.0060	0.009	0.5	0.9	yes	1.113904	1.645924	yes	yes
	MH12	3310.565	MH62A	3307.265	6	660	2549	84	0.01	0.06	3312.25	3308.29	yes	0.0060	0.009	0.6	1.2	yes	1.32432	1.965773	yes	yes
	MH62A	3307.265	MH62	3306.14	6	225	2774	85	0.01	0.06	3308.29	3306.94	yes	0.0060	0.009	0.6	1.2	yes	1.340085	1.989175	yes	yes
	MH62	3306.14	MH61	3302.14	6	800	3574	96	0.02	0.06	3306.94	3302.14	yes	0.0060	0.009	0.7	1.3	yes	1.360509	2.075398	yes	yes
	MH61	3302.14	MH 61A	3299.14	6	600	4174	140	0.02	0.09	3302.14	3298.54	yes	0.0060	0.009	0.8	1.6	yes	1.501282	2.294594	yes	yes
	MH61A	3299.14	PS #1	3258.7	6	800	4974	149	0.03	0.10	3298.54	3258.70	yes	0.0060	0.009	0.8	1.6	yes	1.53275	2.344116	yes	yes
	PS #1		MH1C		4																	
3b	MH1C	3360.5	MH222	3337.8	6	400	5374	165	0.03	0.11	3360.50	3337.80	yes	0.0567	0.009	0.5	1.0	yes	3.536936	5.413932	yes	yes
	MH222	3337.8	MH219	3312.68	6	780	6154	180	0.03	0.12	3337.80	3312.68	yes	0.0322	0.009	0.6	1.2	yes	3.002533	4.452995	yes	yes
	MH238	3322.88	MH236	3313.76	6	1520	7674	21	0.00	0.01	3322.88	3313.76	yes	0.0060	0.009	0.3	0.6	yes	0.895409	1.32432	**no**	yes
	MH236	3313.76	MH219	3312.68	6	180	7854	23	0.00	0.02	3313.76	3312.68	yes	0.0060	0.009	0.3	0.6	yes	0.882168	1.373815	**no**	yes
	MH219	3312.68	MH217	3307.3	6	600	8454	211	0.04	0.14	3312.68	3307.30	yes	0.0090	0.009	0.9	1.7	yes	2.004453	3.012613	yes	yes
	MH217	3307.3	MH200	3258	6	1500	9954	234	0.04	0.16	3307.30	3258.00	yes	0.0329	0.009	0.7	1.3	yes	3.316241	4.931833	yes	yes
	MH200	3258	MH122	3242.72	6	180	10134	271	0.05	0.18	3258.00	3242.72	yes	0.0849	0.009	0.6	1.1	yes	4.793905	7.104013	yes	yes
	MH124	3261.06	MH122	3242.72	6	500	10634	280	0.05	0.19	3261.06	3242.72	yes	0.0367	0.009	0.7	1.4	yes	3.593551	5.355374	yes	yes
	MH122	3242.72	MH121	3219.9	6	400	11034	280	0.05	0.19	3242.72	3219.90	yes	0.0570	0.009	0.6	1.3	yes	4.181178	6.212108	yes	yes
	MH121	3219.9	MH119	3205	6	650	11684	290	0.05	0.20	3219.90	3205.00	yes	0.0229	0.009	0.8	1.6	yes	3.109799	4.562373	yes	yes
	MH119	3205	MH118B	3194	6	77	11761	290	0.05	0.20	3205.00	3194.00	yes	0.1429	0.009	0.5	1.0	yes	5.814085	8.890246	yes	yes
	MH118B	3194	MH118A	3173	6	270	12031	292	0.05	0.20	3194.00	3173.00	yes	0.0778	0.009	0.6	1.2	yes	4.603587	7.023864	yes	yes
	MH118A	3173	PS #2	3162.5	6	140	12171	293	0.05	0.20	3173.00	3162.50	yes	0.0750	0.009	0.6	1.2	yes	4.619353	7.047918	yes	yes

Forest Meadows Wastewater Treatment Facility Master Plan
Calaveras County Water District

Conveyance System Capacity Evaluation

Buildout Flow

Average WW production per ESFU = 195 gpd
Peak Hour and I/I flow per ESFU = 661 gpd
Mannings n = 0.009
Maximum Depth Criteria (d/D) = 0.5 D ≤ 6 inch
= 0.67 D > 6 inch

Trunk Sewer	Upstream Manhole Station	Upstream Manhole Invert Elevation (ft)	Downstream Manhole Station	Downstream Manhole Invert Elevation (ft)	Pipe Size (in)	Pipe Length (ft)	Cumulative Pipe Length (ft)	# of ESFUs upstream of upstream MH	Avg Daily Flow (cfs)	Peak Hour Flow (cfs)	Upstream Invert Elevation (ft)	Downstream Invert Elevation (ft)	Water Flowing Down Hill?	Pipe Slope (ft/ft)	Manning *n* Value	Minimum Design Flow Depth (in)	Maximum Design Flow Depth (in)	Flow Depth Critera Met?	VELOCITY TEST: Minimum Design Flow Velocity (ft/s)	VELOCITY TEST: Maximum Design Flow Velocity (ft/s)	PIPE DEPTH TEST: Flow Velocity Critera Met?(Min. Velocity)	PIPE DEPTH TEST: Flow Velocity Critera Met?(Max. Velocity)	Maximum Allowable Peak Hour Flow through section (cfs)	Maximum Allowable Peak Hour Flow through section (gpm)	Possible Additional ESFUs upstream of section	(1) Peak Flow due to existing connections at Buildout (gpd) = PF* Connections	(2) Peak Flow due to existing connections at Buildout (gpm)	(3) Flow contribution from future connections (gpm) = Max. Allowable Peak Hour Flow - (2)	(4) Flow contribution from future connections (gpd)	(5) Additional ESFU's = (4) / Peak Flow
1a	MH59D	3526.2	MH59A	3433.5	6	920	920	13	0.00	0.01	3526.20	3433.50	yes	0.1008	0.009	0.2	0.3	yes	2.374624	3.361401	yes	**yes**	0.48	215	456	8,593	6	209	301,639	456
	MH59A	3433.5	MH58	3430.5	6	600	1520	21	0.01	0.02	3433.50	3430.50	yes	0.0050	0.009	0.4	0.8	**yes**	1.005076	1.425367	yes	yes	0.28	126	253	13,881	10	116	167,088	253
	MH58	3430.5	MH57	3428.5	6	400	1920	26	0.01	0.03	3430.50	3428.50	yes	0.0050	0.009	0.5	0.9	**yes**	1.069535	1.497827	yes	yes	0.28	126	248	17,186	12	114	163,783	248
	MH57	3428.5	MH55	3424.75	6	750	2670	39	0.01	0.04	3428.50	3424.75	yes	0.0050	0.009	0.6	1.1	**yes**	1.163826	1.698895	yes	yes	0.28	126	235	25,779	18	108	155,190	235
	MH55	3424.75	MH81C	3422.6	6	430	3100	43	0.01	0.04	3424.75	3422.60	yes	0.0050	0.009	0.6	1.1	**yes**	1.212803	1.708905	yes	yes	0.28	126	231	28,423	20	106	152,546	231
	MH81C	3422.6	MH81B	3421.6	6	200	3300	79	0.02	0.08	3422.60	3421.60	yes	0.0050	0.009	0.8	1.5	**yes**	1.453852	2.047787	yes	yes	0.28	126	195	52,219	36	89	128,750	195
	MH81B	3421.6	MH81	3419.45	6	430	3730	90	0.03	0.09	3421.60	3419.45	yes	0.0050	0.009	0.9	1.6	**yes**	1.472272	2.146596	yes	yes	0.28	126	184	59,490	41	84	121,479	184
	MH81	3419.45	MH71	3414.55	6	980	4710	96	0.03	0.10	3419.45	3414.55	yes	0.0050	0.009	0.9	1.7	**yes**	1.513149	2.200601	yes	yes	0.28	126	178	63,456	44	82	117,513	178
	MH71	3414.55	MH101	3331.57	6	1050	5760	107	0.03	0.11	3414.55	3331.57	yes	0.0790	0.009	0.5	0.9	**yes**	4.103318	5.933297	yes	yes	0.28	126	167	70,727	49	77	110,242	167
	MH101	3331.57	MH102	3327.97	6	950	6710	114	0.03	0.12	3331.57	3327.97	yes	0.0038	0.009	1.1	2.0	**yes**	1.465008	2.073163	yes	yes	0.24	108	121	75,354	52	55	79,762	**121**
	MH102	3327.97	MH105	3302.32	6	970	7680	125	0.04	0.13	3327.97	3302.32	yes	0.0264	0.009	0.7	1.2	**yes**	3.013292	4.316958	yes	yes	0.65	292	511	82,625	57	234	337,481	511
	MH105	3302.32	MH107	3272.05	6	800	8480	125	0.04	0.13	3302.32	3272.05	yes	0.0378	0.009	0.6	1.2	**yes**	3.339325	4.824456	yes	yes	0.78	350	638	82,625	57	293	421,502	638
1b	MH107	3272.05	MH265	3250.38	6	210	8690	141	0.04	0.14	3272.05	3250.38	yes	0.1032	0.009	0.5	1.0	yes	5.057205	7.013955	yes	**yes**	0.46	206	309	93,201	65	142	204,105	**309**
	MH265	3250.38	MH264	3230	6	310	9000	150	0.05	0.15	3250.38	3230.00	yes	0.0657	0.009	0.6	1.1	yes	4.230707	6.14229	yes	**yes**	0.82	368	652	99,150	69	299	430,830	652
1c	MH264	3230	MH262	3189.08	8	810	9810	153	0.05	0.16	3230.00	3189.08	yes	0.0505	0.009	0.6	1.1	yes	3.842931	5.502101	yes	**yes**	1.23	552	1050	101,133	70	482	693,836	1050
	MH262	3189.08	MH260	3169.18	8	200	10010	153	0.05	0.16	3189.08	3169.18	yes	0.0995	0.009	0.5	0.9	yes	4.712794	6.895067	yes	**yes**	0.53	238	365	101,133	70	168	241,415	365
	MH260	3169.18	MH259	3159.42	8	380	10390	153	0.05	0.16	3169.18	3159.42	yes	0.0257	0.009	0.7	1.3	**yes**	3.008941	4.294181	yes	yes	2.21	992	2008	101,133	70	922	1,327,227	2008
	MH259	3159.42	PS #2	3157.5	8	320	10710	156	0.10	0.16	3159.42	3157.50	yes	0.0060	0.009	1.5	1.9	**yes**	2.258077	2.609553	yes	yes	1.07	480	890	103,116	72	409	588,443	890
2a	MH38	3267.5	MH6	3264.4	6	620	620	8	0.00	0.01	3267.50	3264.40	yes	0.0050	0.009	0.3	0.5	**yes**	0.684002	1.03994	**no**	yes	0.28	126	266	5,288	4	122	175,681	266
	MH6	3264.4	MH5	3262.9	6	300	920	13	0.00	0.01	3264.40	3262.90	yes	0.0050	0.009	0.4	0.6	**yes**	0.808159	1.242888	**no**	yes	0.28	126	261	8,593	6	120	172,376	261
	MH5	3262.9	MH2	3257.55	6	1070	1990	32	0.01	0.03	3262.90	3257.55	yes	0.0050	0.009	0.5	1.0	**yes**	1.076637	1.59182	yes	yes	0.28	126	242	21,152	15	111	159,817	242
	MH2	3257.55	MH1	3256.05	6	300	2290	65	0.02	0.07	3257.55	3256.05	yes	0.0050	0.009	0.8	1.4	**yes**	1.360297	1.929813	yes	yes	0.28	126	209	42,965	30	96	138,004	209
	MH1	3256.05	MH114	3250.75	6	1060	3350	124	0.04	0.13	3256.05	3250.75	yes	0.0050	0.009	1.0	1.9	**yes**	1.645341	2.330542	yes	yes	0.28	126	150	81,964	57	69	99,005	150
	MH114	3250.75	MH116	3201.04	6	580	3930	132	0.04	0.13	3250.75	3201.04	yes	0.0857	0.009	0.5	1.0	yes	4.441129	6.566256	yes	**yes**	0.58	260	435	87,252	61	200	287,612	435
	MH116	3201.04	MH112	3200.5	6	150	4080	161	0.05	0.16	3201.04	3200.50	yes	0.0036	0.009	1.3	2.4	**yes**	1.597552	2.25342	yes	yes	0.24	108	74	106,421	74	34	48,695	**74**
2b	MH112	3200.5	MH117	3193.86	6	460	4540	178	0.05	0.18	3200.50	3193.86	yes	0.0144	0.009	0.9	1.8	**yes**	2.705917	3.782168	yes	yes	0.48	215	291	117,658	82	134	192,574	**291**
	MH117	3193.86	MH118	3173.4	6	470	5010	178	0.05	0.18	3193.86	3173.40	yes	0.0435	0.009	0.7	1.3	**yes**	3.898865	5.687579	yes	yes	0.84	377	643	117,658	82	295	425,248	643
	MH118	3173.4	PS #2	3162.5	6	480	5490	209	0.06	0.21	3173.40	3162.50	yes	0.0227	0.009	0.9	1.7	**yes**	3.294251	4.69887	yes	yes	0.6	269	378	138,149	96	173	249,641	378
3a	MH31	3320.3	MH29	3319.965	6	67	9	9	0.00	0.01	3323.93	3323.53	yes	0.0060	0.009	0.3	0.5	**yes**	0.769502	1.169932	**no**	yes	0.31	139	294	5,949	4	135	194,409	**294**
	MH29	3319.965	MH27	3315.965	6	800	809	20	0.01	0.02	3323.53	3318.73	yes	0.0060	0.009	0.4	0.7	**yes**	1.039083	1.484961	yes	yes	0.31	139	283	13,220	9	130	187,138	283
	MH27	3315.965	MH24	3313.315	6	530	1339	29	0.01	0.03	3318.73	3315.55	yes	0.0060	0.009	0.5	0.9	**yes**	1.112114	1.670653	yes	yes	0.31	139	274	19,169	13	126	181,189	274
	MH24	3313.315	MH12	3310.565	6	550	1889	45	0.01	0.05	3315.55	3312.25	yes	0.0060	0.009	0.6	1.1	**yes**	1.269212	1.842687	yes	yes	0.31	139	258	29,745	21	118	170,613	258
	MH12	3310.565	MH62A	3307.265	6	660	2549	84	0.03	0.09	3312.25	3308.29	yes	0.0060	0.009	0.8	1.5	**yes**	1.545868	2.225091	yes	yes	0.31	139	219	55,524	39	101	144,834	219
	MH62A	3307.265	MH62	3306.14	6	225	2774	85	0.03	0.09	3308.29	3306.94	yes	0.0060	0.009	0.8	1.5	**yes**	1.564271	2.25158	yes	yes	0.31	139	218	56,185	39	100	144,173	218
	MH62	3306.14	MH61	3302.14	6	800	3574	96	0.03	0.10	3306.94	3302.14	yes	0.0060	0.009	0.9	1.6	**yes**	1.631521	2.33669	yes	yes	0.31	139	207	63,456	44	95	136,902	207
	MH61	3302.14	MH 61A	3299.14	6	600	4174	140	0.04	0.14	3302.14	3298.54	yes	0.0060	0.009	1.1	1.9	**yes**	1.799133	2.587987	yes	yes	0.31	139	163	92,540	64	75	107,818	163
	MH61A	3299.14	PS #1	3258.7	6	800	4974	149	0.04	0.15	3298.54	3258.70	yes	0.0060	0.009	1.1	2.0	**yes**	1.855831	2.62411	yes	yes	0.31	139	154	98,489	68	71	101,869	**154**
	PS #1		MH1C		4																			0	0	0	0	0	0	0	0
3b	MH1C	3360.5	MH222	3337.8	6	400	5374	165	0.05	0.17	3360.50	3337.80	yes	0.0567	0.009	0.7	1.2	**yes**	4.183331	6.017168	yes	yes	0.96	431	774	109,065	76	355	511,399	774
	MH222	3337.8	MH219	3312.68	6	780	6154	180	0.05	0.18	3337.80	3312.68	yes	0.0322	0.009	0.8	1.4	**yes**	3.604234	5.099692	yes	yes	0.72	323	524	118,980	83	241	346,368	524
	MH238	3322.88	MH236	3313.76	6	1520	7674	21	0.01	0.02	3322.88	3313.76	yes	0.0060	0.009	0.4	0.8	**yes**	1.005076	1.489726	yes	yes	0.31	139	282	13,881	10	129	186,477	282
	MH236	3313.76	MH219	3312.68	6	180	7854	23	0.01	0.02	3313.76	3312.68	yes	0.0060	0.009	0.4	0.8	**yes**	1.100797	1.561116	yes	yes	0.31	139	280	15,203	11	129	185,155	280
	MH219	3312.68	MH217	3307.3	6	600	8454	211	0.06	0.22	3312.68	3307.30	yes	0.0090	0.009	1.2	2.2	**yes**	2.402448	3.342165	yes	yes	0.38	171	161	139,471	97	74	106,129	161
	MH217	3307.3	MH200	3258	6	1500	9954	234	0.07	0.24	3307.30	3258.00	yes	0.0329	0.009	0.9	1.6	**yes**	3.827907	5.470642	yes	yes	0.73	328	480	154,674	107	220	317,137	480
	MH200	3258	MH122	3242.72	6	180	10134	271	0.08	0.28	3258.00	3242.72	yes	0.0849	0.009	0.8	1.4	yes	5.671391	8.045835	yes	**yes**	0.58	260	296	179,131	124	136	195,733	296
	MH124	3261.06	MH122	3242.72	6	500	10634	280	0.08	0.29	3261.06	3242.72	yes	0.0367	0.009	0.9	1.7	**yes**	4.256498	6.060854	yes	yes	0.77	346	473	185,080	129	217	312,584	473
	MH122	3242.72	MH121	3219.9	6	400	11034	280	0.08	0.29	3242.72	3219.90	yes	0.0570	0.009	0.9	1.6	**yes**	4.94903	7.104912	yes	yes	0.96	431	659	185,080	129	302	435,384	659
	MH121	3219.9	MH119	3205	6	650	11684	290	0.09	0.30	3219.90	3205.00	yes	0.0229	0.009	1.1	2.0	**yes**	3.612021	5.189369	yes	yes	0.61	274	307	191,690	133	141	202,563	306
	MH119	3205	MH118B	3194	6	77	11761	290	0.09	0.30	3205.00	3194.00	yes	0.1429	0.009	0.7	1.2	yes	6.990838	10.01534	yes	**no**	0.32	144	23	191,690	133	11	15,131	**23**
	MH118B	3194	MH118A	3173	6	270	12031	292	0.09	0.30	3194.00	3173.00	yes	0.0778	0.009	0.8	1.5	yes	5.60177	8.08636	yes	**yes**	0.65	292	344	193,012	134	158	227,094	344
	MH118A	3173	PS #2	3162.5	6	140	12171	293	0.09	0.30	3173.00	3162.50	yes	0.0750	0.009	0.8	1.5	yes	5.620955	7.934238	yes	**yes**	0.7	314	392	193,673	134	180	258,749	391

Appendix C

Water Balance Calculations

Table C-1. Current Conditions (Current Storage Requirements and Current Irrigation Rates)
Water Balance - Forest Meadows Facility and Financial Plan
No Modifications

		EFFLUENT PRODUCTION					HISTORIC WEATHER DATA			INFLOW / OUTFLOW FROM STORAGE FACILITY							GOLF COURSE APPLICATION RATES
		ADWF			I/I	Total Effluent	Precipitation		ET	Inflow, ac-ft		Outflow, ac-ft		Storage Facility Volume, ac-ft			Current Application Rates
Month		gpd	gall/month	ac-ft/month	ac-ft/month	ac-ft	% of Total	in/month	in/month	Effluent	Precipitation	Evaporation	Demand	Change	Req'd Storage w/Drawdown	Req'd Storage w/o Drawdown	ac-ft
(1)	Days			(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Oct	31	51,400	1,593,400	4.89	0.29	5.18	6.9	4.4	3.7	5.2	3.4	0.9	10.0	0.0			9.98
Nov	30	51,400	1,542,000	4.73	0.25	4.98	13.1	8.5	2.1	5.0	6.5	0.5	5.6	5.3	5.3	56	5.63
Dec	31	51,400	1,593,400	4.89	0.90	5.79	16.6	10.8	**0.0**	5.8	8.2	0.0	0.0	14.0	19.3	70	0.00
Jan	31	51,400	1,593,400	4.89	4.68	9.57	16.6	10.8	**0.0**	9.6	8.2	0.0	0.0	17.7	37.0	88	0.00
Feb	28	51,400	1,439,200	4.42	0.34	4.76	13.7	8.9	**0.0**	4.8	6.8	0.0	0.0	11.5	48.5	99	0.00
Mar	31	51,400	1,593,400	4.89	4.89	9.78	12.6	8.2	**0.0**	9.8	6.2	0.0	0.0	16.0	**64.5**	**115**	0.00
Apr	30	51,400	1,542,000	4.73	1.49	6.22	8.6	5.6	4.5	6.2	4.2	1.1	12.1	-2.7	**Exceeds Capacity**	**Exceeds Capacity**	12.07
May	31	51,400	1,593,400	4.89	2.23	7.12	4.6	3.0	5.9	7.1	2.3	1.5	15.8	-7.9			15.80
Jun	30	51,400	1,542,000	4.73	0.27	5.00	1.7	1.1	7.2	5.0	0.8	1.8	19.3	-15.3			19.31
Jul	31	51,400	1,593,400	4.89	0.21	5.10	1.1	0.7	8.1	5.1	0.6	2.0	21.6	-18.0			21.62
Aug	31	51,400	1,593,400	4.89	0.00	4.89	1.7	1.1	7.4	4.9	0.8	1.8	20.0	-16.1			19.96
Sep	30	51,400	1,542,000	4.73	0.00	4.73	2.9	1.9	5.7	4.7	1.4	1.4	15.3	-10.6			15.29
Total					15.55	73.1	100.0	64.9	44.6	73.1	49.3	11.1	119.7	-6.0			119.7

Average Dry Weather Flow, gal/d:	51,400	Current ADWF
Average Storage Pond surface area, ac	5.0	Obtained from Figure 8. Storage Facility Characteristics; Average of surface areas corresponding to minimum (50.6 ac-ft) and maximum (109 ac-ft) storage volumes.
Total pond catchment/storage area, ac:	9.1	Calculated by HDR Engineering
Application Area, acres:	40	Obtained from Geoff Olson - Golf course superintendent
Available Storage, acre-ft		
	109.0	With complete drawdown
	58.4	With drawdown limited to 50.6 acre-ft
Maximum Irrigation Application Rate (in/ac-yr)	35.9	
Maximum Irrigation Demand (ac-ft)	119.7	
Total Available Water (ac-ft)	111.4	Effluent + Precipitation - Evaporation
Supplemental Water Requirements (ac-ft)	8.3	
Over Irrigation ?	**Okay**	

(1) Water accumulation in storage pond begins in November.
(2) ADWF converted to acre-ft/month
(3) Calculated 1995 I/I flows. ADWF and influent flows obtained from CCWD 1995 monitoring reports.
(4) Total effluent flow is equal to the sum of the ADWF plus I/I. Column (2) + Column (3)
(5) Percent of annual rainfall total within given month.
(6) Monthly 100-yr annual precipitation values based on total annual rainfall of 64.9 inches measured at Murphys Weather Station.
(7) Evapotranspiration rates obtained from the California Irrigation Management Information System (CIMIS) for Zone 11
(8) Equal to Column (4)
(9) Precipitation inflow is equal to the product of the precipitation (5) and total pond catchment area (9.1 acres).
(10) Estimated evaporation outflow = Pan Coefficient x Shading Factor x Column (7) Storage Pond Surface Area, pan coefficient = 0.7, shading factor = 0.85. It is assumed that evapotranspiration rate is equal to evaporation rate.
(11) Wastewater outflow demand is equal to the applied wastewater (15) over 40 acres of irrigation area
(12) Volume change equals Effluent + Precipitation - Evaporation (Column 10) - Demand. Negative value represents emptying the Storage Facility. Storage Facility fills October through March.
(13) Effluent storage requirements with complete drawdown; reservoir volume assumed to contain 0 acre-ft at the beginning of October.
(14) Effluent storage requirements with drawdown limited to 50.6 acre-ft (607.2 acre-in); ; reservoir volume assumed to contain 50.6 acre-ft at the end of October.
(15) Estimated irrigation rate based on average of agronomic rates and information obtained from other local golf courses. Monthly irrigation rates are proportioned based on monthly ET values (7).

Table C-2. Current Conditions (Current Storage Requirements and Current Irrigation Rates)
Water Balance - Forest Meadows Facility and Financial Plan
No Modifications, Capacity Estimation

		EFFLUENT PRODUCTION					HISTORIC WEATHER DATA			INFLOW / OUTFLOW FROM STORAGE FACILITY							GOLF COURSE APPLICATION RATES
		ADWF			I/I	Total Effluent	Precipitation		ET	Inflow, ac-ft		Outflow, ac-ft		Storage Facility Volume, ac-ft			Current Application Rates
Month		gpd	gall/month	ac-ft/month	ac-ft/month	ac-ft	% of Total	in/month	in/month	Effluent	Precipitation	Evaporation	Demand	Change	Req'd Storage w/Drawdown	Req'd Storage w/o Drawdown	ac-ft
(1)	Days			(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Oct	31	38,200	1,184,200	3.63	0.29	3.92	6.9	4.4	3.7	3.9	3.4	0.9	10.0	0.0			9.98
Nov	30	38,200	1,146,000	3.52	0.25	3.77	13.1	8.5	2.1	3.8	6.5	0.5	5.6	4.1	4.1	55	5.63
Dec	31	38,200	1,184,200	3.63	0.90	4.53	16.6	10.8	**0.0**	4.5	8.2	0.0	0.0	12.7	16.8	67	0.00
Jan	31	38,200	1,184,200	3.63	4.68	8.31	16.6	10.8	**0.0**	8.3	8.2	0.0	0.0	16.5	33.3	84	0.00
Feb	28	38,200	1,069,600	3.28	0.34	3.62	13.7	8.9	**0.0**	3.6	6.8	0.0	0.0	10.4	43.7	94	0.00
Mar	31	38,200	1,184,200	3.63	4.89	8.52	12.6	8.2	**0.0**	8.5	6.2	0.0	0.0	14.7	**58.4**	**109**	0.00
Apr	30	38,200	1,146,000	3.52	1.49	5.01	8.6	5.6	4.5	5.0	4.2	1.1	12.1	-4.0	**Okay**	**Okay**	12.07
May	31	38,200	1,184,200	3.63	2.23	5.86	4.6	3.0	5.9	5.9	2.3	1.5	15.8	-9.1			15.80
Jun	30	38,200	1,146,000	3.52	0.27	3.79	1.7	1.1	7.2	3.8	0.8	1.8	19.3	-16.5			19.31
Jul	31	38,200	1,184,200	3.63	0.21	3.84	1.1	0.7	8.1	3.8	0.6	2.0	21.6	-19.2			21.62
Aug	31	38,200	1,184,200	3.63	0.00	3.63	1.7	1.1	7.4	3.6	0.8	1.8	20.0	-17.3			19.96
Sep	30	38,200	1,146,000	3.52	0.00	3.52	2.9	1.9	5.7	3.5	1.4	1.4	15.3	-11.8			15.29
Total					15.55	58.3	100.0	64.9	44.6	58.3	49.3	11.1	119.7	-19.5			119.7

Average Dry Weather Flow, gal/d:	38,200	Current ADWF Capacity
Average Storage Pond surface area, ac	5.0	Obtained from Figure 8. Storage Facility Characteristics; Average of surface areas corresponding to minimum (50.6 ac-ft) and maximum (109 ac-ft) storage volumes.
Total pond catchment/storage area, ac:	9.1	Calculated by HDR Engineering
Application Area, acres:	40	Obtained from Geoff Olson - Golf course superintendent
Available Storage, acre-ft		
	109.0	With complete drawdown
	58.4	With drawdown limited to 50.6 acre-ft
Maximum Irrigation Application Rate (in/ac-yr)	35.9	
Maximum Irrigation Demand (ac-ft)	119.7	
Total Available Water (ac-ft)	96.6	Effluent + Precipitation - Evaporation
Supplemental Water Requirements (ac-ft)	23.1	
Over Irrigation ?	**Okay**	
Estimated Number of New Connections (ESFUs)	**-120**	**120 ESFUs overcapacity (@110 gpd/ESFU)**

(1) Water accumulation in storage pond begins in November.
(2) ADWF converted to acre-ft/month
(3) Calculated 1995 I/I flows. ADWF and influent flows obtained from CCWD 1995 monitoring reports.
(4) Total effluent flow is equal to the sum of the ADWF plus I/I. Column (2) + Column (3)
(5) Percent of annual rainfall total within given month.
(6) Monthly 100-yr annual precipitation values based on total annual rainfall of 64.9 inches measured at Murphys Weather Station.
(7) Evapotranspiration rates obtained from the California Irrigation Management Information System (CIMIS) for Zone 11
(8) Equal to Column (4)
(9) Precipitation inflow is equal to the product of the precipitation (5) and total pond catchment area (9.1 acres).
(10) Estimated evaporation outflow = Pan Coefficient x Shading Factor x Column (7) Storage Pond Surface Area, pan coefficient = 0.7, shading factor = 0.85. It is assumed that evapotranspiration rate is equal to evaporation rate.
(11) Wastewater outflow demand is equal to the applied wastewater (15) over 40 acres of irrigation area
(12) Volume change equals Effluent + Precipitation - Evaporation (Column 10) - Demand. Negative value represents emptying the Storage Facility. Storage Facility fills October through March.
(13) Effluent storage requirements with complete drawdown; reservoir volume assumed to contain 0 acre-ft at the beginning of October.
(14) Effluent storage requirements with drawdown limited to 50.6 acre-ft (607.2 acre-in); ; reservoir volume assumed to contain 50.6 acre-ft at the end of October.
(15) Estimated irrigation rate based on average of agronomic rates and information obtained from other local golf courses. Monthly irrigation rates are proportioned based on monthly ET values (7).

Table C-3. Future Conditions (Add/Subtract Connections to Equal Capacity)
Water Balance - Forest Meadows Facility and Financial Plan
Reduce Storage Pond Catchment Area to 8.0 acres

		EFFLUENT PRODUCTION							HISTORIC WEATHER DATA			INFLOW / OUTFLOW FROM STORAGE FACILITY							GOLF COURSE APPLICATION RATES
		ADWF			I/I (ac-ft/month)			Total Effluent	Precipitation		ET	Inflow, ac-ft		Outflow, ac-ft		Storage Facility Volume, ac-ft			Current Application Rates
Month		gpd	gall/month	ac-ft/month	Current ESFUs	Future ESFUs	Total	ac-ft	% of Total	in/month	in/month	Effluent	Precipitation	Evaporation	Demand	Change	Req'd Storage w/Drawdown	Req'd Storage w/o Drawdown	ac-ft
(1)	Days			(2)	(3)	(3.25)	(3.66)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Oct	31	48,300	1,497,300	4.59	0.29	-0.01	0.28	4.88	6.9	4.4	3.7	4.9	3.0	0.9	10.0	0.0			9.98
Nov	30	48,300	1,449,000	4.45	0.25	-0.01	0.24	4.69	13.1	8.5	2.1	4.7	5.7	0.5	5.6	4.2	4.2	55	5.63
Dec	31	48,300	1,497,300	4.59	0.90	-0.02	0.88	5.47	16.6	10.8	**0.0**	5.5	7.2	0.0	0.0	12.6	16.9	67	0.00
Jan	31	48,300	1,497,300	4.59	4.68	-0.12	4.56	9.15	16.6	10.8	**0.0**	9.2	7.2	0.0	0.0	16.3	33.2	84	0.00
Feb	28	48,300	1,352,400	4.15	0.34	-0.01	0.33	4.48	13.7	8.9	**0.0**	4.5	5.9	0.0	0.0	10.4	43.6	94	0.00
Mar	31	48,300	1,497,300	4.59	4.89	-0.13	4.76	9.36	12.6	8.2	**0.0**	9.4	5.4	0.0	0.0	14.8	**58.4**	**109**	0.00
Apr	30	48,300	1,449,000	4.45	1.49	-0.04	1.45	5.90	8.6	5.6	4.5	5.9	3.7	1.1	12.1	-3.6	**Okay**	**Okay**	12.07
May	31	48,300	1,497,300	4.59	2.23	-0.06	2.17	6.77	4.6	3.0	5.9	6.8	2.0	1.5	15.8	-8.5			15.80
Jun	30	48,300	1,449,000	4.45	0.27	-0.01	0.26	4.71	1.7	1.1	7.2	4.7	0.7	1.8	19.3	-15.6			19.31
Jul	31	48,300	1,497,300	4.59	0.21	-0.01	0.20	4.80	1.1	0.7	8.1	4.8	0.5	2.0	21.6	-18.3			21.62
Aug	31	48,300	1,497,300	4.59	0.00	0.00	0.00	4.59	1.7	1.1	7.4	4.6	0.7	1.8	20.0	-16.5			19.96
Sep	30	48,300	1,449,000	4.45	0.00	0.00	0.00	4.45	2.9	1.9	5.7	4.4	1.2	1.4	15.3	-11.0			15.29
Total					15.55	-0.40	15.15	69.2	100.0	64.9	44.6	69.2	43.3	11.1	119.7	-15.2			119.7

Average Dry Weather Flow, gal/d:	48,300	ADWF Capacity
Average Storage Pond surface area, ac	5.0	Obtained from Figure 8. Storage Facility Characteristics; Average of surface areas corresponding to minimum (50.6 ac-ft) and maximum (109 ac-ft) storage volumes.
Total pond catchment/storage area, ac:	**8.0**	Calculated by HDR Engineering
Application Area, acres:	40	Obtained from Geoff Olson - Golf course superintendent
Available Storage, acre-ft		
	109.0	With complete drawdown
	58.4	With drawdown limited to 50.6 acre-ft
Maximum Irrigation Application Rate (in/ac-yr)	35.9	
Maximum Irrigation Demand (ac-ft)	119.7	
Total Available Water (ac-ft)	101.4	Effluent + Precipitation - Evaporation
Supplemental Water Requirements (ac-ft)	18.2	
Over Irrigation ?	**Okay**	
Estimated Number of New Connections (ESFUs)	**-28**	**30 ESFUs over capacity (@110gpd/ESFU)**

(1) Water accumulation in storage pond begins in November.
(2) ADWF converted to acre-ft/month
(3) Calculated 1995 I/I flows. ADWF and influent flows obtained from CCWD 1995 monitoring reports.
(3.33)
(3.66)
(4) Total effluent flow is equal to the sum of the ADWF plus I/I. Column (2) + Column (3)
(5) Percent of annual rainfall total within given month.
(6) Monthly 100-yr annual precipitation values based on total annual rainfall of 64.9 inches measured at Murphys Weather Station.
(7) Evapotranspiration rates obtained from the California Irrigation Management Information System (CIMIS) for Zone 11
(8) Equal to Column (4)
(9) Precipitation inflow is equal to the product of the precipitation (5) and total pond catchment area (9.1 acres).
(10) Estimated evaporation outflow = Pan Coefficient x Shading Factor x Column (7) Storage Pond Surface Area, pan coefficient = 0.7, shading factor = 0.85. It is assumed that evapotranspiration rate is equal to evaporation rate.
(11) Wastewater outflow demand is equal to the applied wastewater (15) over 40 acres of irrigation area
(12) Volume change equals Effluent + Precipitation - Evaporation (Column 10) - Demand. Negative value represents emptying the Storage Facility. Storage Facility fills October through March.
(13) Effluent storage requirements with complete drawdown; reservoir volume assumed to contain 0 acre-ft at the beginning of October.
(14) Effluent storage requirements with drawdown limited to 50.6 acre-ft (607.2 acre-in); ; reservoir volume assumed to contain 50.6 acre-ft at the end of October.
(15) Estimated irrigation rate based on average of agronomic rates and information obtained from other local golf courses. Monthly irrigation rates are proportioned based on monthly ET values (7).

Table C-4. Future Conditions (Add Connections to Equal Capacity)
Water Balance - Forest Meadows Facility and Financial Plan
Storage Volume Required to Match Irrigation Capacity

		EFFLUENT PRODUCTION							HISTORIC WEATHER DATA			INFLOW / OUTFLOW FROM STORAGE FACILITY							GOLF COURSE APPLICATION RATES
		ADWF			I/I (ac-ft/month)			Total Effluent	Precipitation		ET	Inflow, ac-ft		Outflow, ac-ft		Storage Facility Volume, ac-ft			Current Application Rates
Month		gpd	gall/month	ac-ft/month	Current ESFUs	Future ESFUs	Total	ac-ft	% of Total	in/month	in/month	Effluent	Precipitation	Evaporation	Demand	Change	Req'd Storage w/Drawdown	Req'd Storage w/o Drawdown	ac-ft
(1)	Days			(2)	(3)	(3.25)	(3.66)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Oct	31	58,430	1,811,330	5.56	0.29	0.01	0.30	5.86	6.9	4.4	3.7	5.9	3.4	0.9	10.0	0.0			9.98
Nov	30	58,430	1,752,900	5.38	0.25	0.01	0.26	5.64	13.1	8.5	2.1	5.6	6.5	0.5	5.6	6.0	6.0	57	5.63
Dec	31	58,430	1,811,330	5.56	0.90	0.03	0.93	6.49	16.6	10.8	**0.0**	6.5	8.2	0.0	0.0	14.6	20.6	71	0.00
Jan	31	58,430	1,811,330	5.56	4.68	0.16	4.84	10.39	16.6	10.8	**0.0**	10.4	8.2	0.0	0.0	18.5	39.1	90	0.00
Feb	28	58,430	1,636,040	5.02	0.34	0.01	0.35	5.37	13.7	8.9	**0.0**	5.4	6.7	0.0	0.0	12.1	51.3	102	0.00
Mar	31	58,430	1,811,330	5.56	4.89	0.16	5.05	10.61	12.6	8.2	**0.0**	10.6	6.2	0.0	0.0	16.8	**68.1**	**119**	0.00
Apr	30	58,430	1,752,900	5.38	1.49	0.05	1.54	6.92	8.6	5.6	4.5	6.9	4.2	1.1	12.1	-2.1	**Exceeds Capacity**	**Exceeds Capacity**	12.07
May	31	58,430	1,811,330	5.56	2.23	0.07	2.30	7.86	4.6	3.0	5.9	7.9	2.2	1.5	15.8	-7.1			15.80
Jun	30	58,430	1,752,900	5.38	0.27	0.01	0.28	5.66	1.7	1.1	7.2	5.7	0.8	1.8	19.3	-14.6			19.31
Jul	31	58,430	1,811,330	5.56	0.21	0.01	0.22	5.77	1.1	0.7	8.1	5.8	0.6	2.0	21.6	-17.3			21.62
Aug	31	58,430	1,811,330	5.56	0.00	0.00	0.00	5.56	1.7	1.1	7.4	5.6	0.8	1.8	20.0	-15.4			19.96
Sep	30	58,430	1,752,900	5.38	0.00	0.00	0.00	5.38	2.9	1.9	5.7	5.4	1.4	1.4	15.3	-9.9			15.29
Total					15.55	0.52	16.07	81.5	100.0	64.9	44.6	81.5	49.2	11.1	119.7	1.7			119.7

Average Dry Weather Flow, gal/d:	58,430	ADWF Capacity
Average Storage Pond surface area, ac	5.0	Obtained from Figure 8. Storage Facility Characteristics; Average of surface areas corresponding to minimum (50.6 ac-ft) and maximum (109 ac-ft) storage volumes.
Total pond catchment/storage area, ac:	**9.1**	Calculated by HDR Engineering
Application Area, acres:	40	Obtained from Geoff Olson - Golf course superintendent
Available Storage, acre-ft		
	109.0	With complete drawdown
	58.4	With drawdown limited to 50.6 acre-ft
Maximum Irrigation Application Rate (in/ac-yr)	35.9	
Maximum Irrigation Demand (ac-ft)	119.7	
Total Available Water (ac-ft)	119.7	Effluent + Precipitation - Evaporation
Supplemental Water Requirements (ac-ft)	0.0	
Over Irrigation ?	**Okay**	
Estimated Number of New Connections (ESFUs)	**36**	**(@195 gpd/ESFU)**
Additional Storage Volume Required (ac-ft)	**9.7**	

(1) Water accumulation in storage pond begins in November.
(2) ADWF converted to acre-ft/month
(3) Calculated 1995 I/I flows. ADWF and influent flows obtained from CCWD 1995 monitoring reports.
(3.33)
(3.66)
(4) Total effluent flow is equal to the sum of the ADWF plus I/I. Column (2) + Column (3)
(5) Percent of annual rainfall total within given month.
(6) Monthly 100-yr annual precipitation values based on total annual rainfall of 64.9 inches measured at Murphys Weather Station.
(7) Evapotranspiration rates obtained from the California Irrigation Management Information System (CIMIS) for Zone 11
(8) Equal to Column (4)
(9) Precipitation inflow is equal to the product of the precipitation (5) and total pond catchment area (9.1 acres).
(10) Estimated evaporation outflow = Pan Coefficient x Shading Factor x Column (7) Storage Pond Surface Area, pan coefficient = 0.7, shading factor = 0.85. It is assumed that evapotranspiration rate is equal to evaporation rate.
(11) Wastewater outflow demand is equal to the applied wastewater (15) over 40 acres of irrigation area
(12) Volume change equals Effluent + Precipitation - Evaporation (Column 10) - Demand. Negative value represents emptying the Storage Facility. Storage Facility fills October through March.
(13) Effluent storage requirements with complete drawdown; reservoir volume assumed to contain 0 acre-ft at the beginning of October.
(14) Effluent storage requirements with drawdown limited to 50.6 acre-ft (607.2 acre-in); ; reservoir volume assumed to contain 50.6 acre-ft at the end of October.
(15) Estimated irrigation rate based on average of agronomic rates and information obtained from other local golf courses. Monthly irrigation rates are proportioned based on monthly ET values (7).

Table C-5. Future Conditions (Add Connections to Equal Capacity)
Water Balance - Forest Meadows Facility and Financial Plan
Storage Volume Required to Match Irrigation Capacity, Reduced Catchment Area

		EFFLUENT PRODUCTION							HISTORIC WEATHER DATA			INFLOW / OUTFLOW FROM STORAGE FACILITY							GOLF COURSE APPLICATION RATES
		ADWF			I/I (ac-ft/month)			Total Effluent	Precipitation		ET	Inflow, ac-ft		Outflow, ac-ft		Storage Facility Volume, ac-ft			Current Application Rates
Month		gpd	gall/month	ac-ft/month	Current ESFUs	Future ESFUs	Total	ac-ft	% of Total	in/month	in/month	Effluent	Precipitation	Evaporation	Demand	Change	Req'd Storage w/Drawdown	Req'd Storage w/o Drawdown	ac-ft
(1)	Days			(2)	(3)	(3.25)	(3.66)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Oct	31	63,400	1,965,400	6.03	0.29	0.02	0.31	6.34	6.9	4.4	3.7	6.3	3.0	0.9	10.0	0.0			9.98
Nov	30	63,400	1,902,000	5.84	0.25	0.01	0.26	6.10	13.1	8.5	2.1	6.1	5.7	0.5	5.6	5.6	5.6	56	5.63
Dec	31	63,400	1,965,400	6.03	0.90	0.05	0.95	6.98	16.6	10.8	**0.0**	7.0	7.2	0.0	0.0	14.2	19.8	70	0.00
Jan	31	63,400	1,965,400	6.03	4.68	0.27	4.95	10.98	16.6	10.8	**0.0**	11.0	7.2	0.0	0.0	18.1	37.9	89	0.00
Feb	28	63,400	1,775,200	5.45	0.34	0.02	0.36	5.81	13.7	8.9	**0.0**	5.8	5.9	0.0	0.0	11.7	49.7	100	0.00
Mar	31	63,400	1,965,400	6.03	4.89	0.28	5.17	11.20	12.6	8.2	**0.0**	11.2	5.4	0.0	0.0	16.6	**66.3**	**117**	0.00
Apr	30	63,400	1,902,000	5.84	1.49	0.08	1.57	7.41	8.6	5.6	4.5	7.4	3.7	1.1	12.1	-2.1	**Exceeds Capacity**	**Exceeds Capacity**	12.07
May	31	63,400	1,965,400	6.03	2.23	0.13	2.36	8.39	4.6	3.0	5.9	8.4	2.0	1.5	15.8	-6.9			15.80
Jun	30	63,400	1,902,000	5.84	0.27	0.02	0.29	6.12	1.7	1.1	7.2	6.1	0.7	1.8	19.3	-14.2			19.31
Jul	31	63,400	1,965,400	6.03	0.21	0.01	0.22	6.25	1.1	0.7	8.1	6.3	0.5	2.0	21.6	-16.9			21.62
Aug	31	63,400	1,965,400	6.03	0.00	0.00	0.00	6.03	1.7	1.1	7.4	6.0	0.7	1.8	20.0	-15.0			19.96
Sep	30	63,400	1,902,000	5.84	0.00	0.00	0.00	5.84	2.9	1.9	5.7	5.8	1.2	1.4	15.3	-9.6			15.29
Total					15.55	0.88	16.43	87.4	100.0	64.9	44.6	87.4	43.3	11.1	119.7	1.6			119.7

Average Dry Weather Flow, gal/d:	63,400	ADWF Capacity
Average Storage Pond surface area, ac	5.0	Obtained from Figure 8. Storage Facility Characteristics; Average of surface areas corresponding to minimum (50.6 ac-ft) and maximum (109 ac-ft) storage volumes.
Total pond catchment/storage area, ac:	**8.0**	Calculated by HDR Engineering
Application Area, acres:	40	Obtained from Geoff Olson - Golf course superintendent
Available Storage, acre-ft		
	109.0	With complete drawdown
	58.4	With drawdown limited to 50.6 acre-ft
Maximum Irrigation Application Rate (in/ac-yr)	35.9	
Maximum Irrigation Demand (ac-ft)	119.7	
Total Available Water (ac-ft)	119.6	Effluent + Precipitation - Evaporation
Supplemental Water Requirements (ac-ft)	0.0	
Over Irrigation ?	**Okay**	
Estimated Number of New Connections (ESFUs)	**62**	**(@195 gpd/ESFU)**
Additional Storage Volume Required (ac-ft)	**7.9**	

(1) Water accumulation in storage pond begins in November.
(2) ADWF converted to acre-ft/month
(3) Calculated 1995 I/I flows. ADWF and influent flows obtained from CCWD 1995 monitoring reports.
(3.33)
(3.66)
(4) Total effluent flow is equal to the sum of the ADWF plus I/I. Column (2) + Column (3)
(5) Percent of annual rainfall total within given month.
(6) Monthly 100-yr annual precipitation values based on total annual rainfall of 64.9 inches measured at Murphys Weather Station.
(7) Evapotranspiration rates obtained from the California Irrigation Management Information System (CIMIS) for Zone 11
(8) Equal to Column (4)
(9) Precipitation inflow is equal to the product of the precipitation (5) and total pond catchment area (9.1 acres).
(10) Estimated evaporation outflow = Pan Coefficient x Shading Factor x Column (7) Storage Pond Surface Area, pan coefficient = 0.7, shading factor = 0.85. It is assumed that evapotranspiration rate is equal to evaporation rate.
(11) Wastewater outflow demand is equal to the applied wastewater (15) over 40 acres of irrigation area
(12) Volume change equals Effluent + Precipitation - Evaporation (Column 10) - Demand. Negative value represents emptying the Storage Facility. Storage Facility fills October through March.
(13) Effluent storage requirements with complete drawdown; reservoir volume assumed to contain 0 acre-ft at the beginning of October.
(14) Effluent storage requirements with drawdown limited to 50.6 acre-ft (607.2 acre-in); ; reservoir volume assumed to contain 50.6 acre-ft at the end of October.
(15) Estimated irrigation rate based on average of agronomic rates and information obtained from other local golf courses. Monthly irrigation rates are proportioned based on monthly ET values (7).

Table C-6. Builout Conditions (2 Storage Ponds)
Water Balance - Forest Meadows Facility and Financial Plan
Reduce Storage Pond Catchment Area to 8.0 acres

		EFFLUENT PRODUCTION							HISTORIC WEATHER DATA			INFLOW / OUTFLOW FROM STORAGE FACILITY							GOLF COURSE APPLICATION RATES
		ADWF			I/I (ac-ft/month)			Total Effluent	Precipitation		ET	Inflow, ac-ft		Outflow, ac-ft		Storage Facility Volume, ac-ft			Current Application Rates
Month		gpd	gall/month	ac-ft/month	Current ESFUs	Future ESFUs	Total	ac-ft	% of Total	in/month	in/month	Effluent	Precipitation	Evaporation	Demand	Change	Req'd Storage w/Drawdown	Req'd Storage w/o Drawdown	ac-ft
(1)	Days			(2)	(3)	(3.25)	(3.66)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Oct	31	273,000	8,463,000	25.97	0.29	0.26	0.55	26.52	6.9	4.4	3.7	26.5	5.0	1.5	32.6	0.0			32.58
Nov	30	273,000	8,190,000	25.13	0.25	0.22	0.47	25.60	13.1	8.5	2.1	25.6	9.6	0.8	18.4	16.0	16.0	67	18.39
Dec	31	273,000	8,463,000	25.97	0.90	0.80	1.70	27.67	16.6	10.8	**0.0**	27.7	12.1	0.0	0.0	39.8	55.7	106	0.00
Jan	31	273,000	8,463,000	25.97	4.68	4.18	8.86	34.83	16.6	10.8	**0.0**	34.8	12.1	0.0	0.0	46.9	102.7	153	0.00
Feb	28	273,000	7,644,000	23.46	0.34	0.30	0.64	24.10	13.7	8.9	**0.0**	24.1	10.0	0.0	0.0	34.1	136.8	187	0.00
Mar	31	273,000	8,463,000	25.97	4.89	4.37	9.26	35.22	12.6	8.2	**0.0**	35.2	9.2	0.0	0.0	44.4	**181.2**	**232**	0.00
Apr	30	273,000	8,190,000	25.13	1.49	1.33	2.82	27.95	8.6	5.6	4.5	28.0	6.3	1.8	39.4	-7.0			39.41
May	31	273,000	8,463,000	25.97	2.23	1.99	4.22	30.19	4.6	3.0	5.9	30.2	3.3	2.3	51.6	-20.4			51.59
Jun	30	273,000	8,190,000	25.13	0.27	0.24	0.51	25.64	1.7	1.1	7.2	25.6	1.3	2.9	63.1	-39.0			63.06
Jul	31	273,000	8,463,000	25.97	0.21	0.19	0.40	26.37	1.1	0.7	8.1	26.4	0.8	3.2	70.6	-46.6			70.59
Aug	31	273,000	8,463,000	25.97	0.00	0.00	0.00	25.97	1.7	1.1	7.4	26.0	1.3	3.0	65.2	-40.9			65.16
Sep	30	273,000	8,190,000	25.13	0.00	0.00	0.00	25.13	2.9	1.9	5.7	25.1	2.1	2.3	49.9	-25.0			49.92
Total					15.55	13.88	29.43	335.2	100.0	64.9	44.6	335.2	73.0	17.7	390.7	2.3			390.7

Average Dry Weather Flow, gal/d:	273,000	ADWF Capacity
Average Storage Pond surface area, ac	8.0	Combined surface area of existing storage pond and new 65 ac-ft pond
Total pond catchment/storage area, ac:	13.5	Combined catchment area of existing storage pond and new 65 ac-ft storage pond
Application Area, acres:	130.6	Total required disposal area
Available Storage, acre-ft	109.0	With complete drawdown
	58.5	With drawdown limited to 50.6 acre-ft
Maximum Irrigation Application Rate (in/ac-yr)	35.9	
Maximum Irrigation Demand (ac-ft)	390.7	
Total Available Water (ac-ft)	390.5	Effluent + Precipitation - Evaporation
Over Irrigation ?	**Okay**	
Estimated Number of New Connections (ESFUs)	**970**	

(1) Water accumulation in storage pond begins in November.
(2) ADWF converted to acre-ft/month
(3) Calculated 1995 I/I flows. ADWF and influent flows obtained from CCWD 1995 monitoring reports.
(3.33)
(3.66)
(4) Total effluent flow is equal to the sum of the ADWF plus I/I. Column (2) + Column (3)
(5) Percent of annual rainfall total within given month.
(6) Monthly 100-yr annual precipitation values based on total annual rainfall of 64.9 inches measured at Murphys Weather Station.
(7) Evapotranspiration rates obtained from the California Irrigation Management Information System (CIMIS) for Zone 11
(8) Equal to Column (4)
(9) Precipitation inflow is equal to the product of the precipitation (5) and total pond catchment area (9.1 acres).
(10) Estimated evaporation outflow = Pan Coefficient x Shading Factor x Column (7) Storage Pond Surface Area, pan coefficient = 0.7, shading factor = 0.85. It is assumed that evapotranspiration rate is equal to evaporation rate.
(11) Wastewater outflow demand is equal to the applied wastewater (15) over 40 acres of irrigation area
(12) Volume change equals Effluent + Precipitation - Evaporation (Column 10) - Demand. Negative value represents emptying the Storage Facility. Storage Facility fills October through March.
(13) Effluent storage requirements with complete drawdown; reservoir volume assumed to contain 0 acre-ft at the beginning of October.
(14) Effluent storage requirements with drawdown limited to 50.6 acre-ft (607.2 acre-in); ; reservoir volume assumed to contain 50.6 acre-ft at the end of October.
(15) Estimated irrigation rate based on average of agronomic rates and information obtained from other local golf courses. Monthly irrigation rates are proportioned based on monthly ET values (7).

Table C-7. Builout Conditions with Seasonal Discharge
Water Balance - Forest Meadows Facility and Financial Plan
Reduce Storage Pond Catchment Area to 8.0 acres

		EFFLUENT PRODUCTION							HISTORIC WEATHER DATA			INFLOW / OUTFLOW FROM STORAGE FACILITY							GOLF COURSE APPLICATION RATES	
		ADWF			I/I (ac-ft/month)			Total Effluent	Precipitation		ET	Inflow, ac-ft		Outflow, ac-ft			Storage Facility Volume, ac-ft		Current Application Rates	
Month		gpd	gall/month	ac-ft/month	Current ESFUs	Future ESFUs	Total	ac-ft	% of Total	in/month	in/month	Effluent	Precipitation	Evaporation	Demand	Discharge Flow	Change	Req'd Storage	ac-ft	
(1)	Days			(2)	(3)	(3.25)	(3.66)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)		(12)	(13)	(15)	
Oct	31	273,000	8,463,000	25.97	0.29	0.26	0.55	26.52	6.9	4.4	3.7	26.5	3.0	0.9	10.0	0.0	18.6	**56.6**	9.98	
Nov	30	273,000	8,190,000	25.13	0.25	0.22	0.47	25.60	13.1	8.5	2.1	25.6	5.7	0.5	5.6	44.0	-18.8	37.7	5.63	
Dec	31	273,000	8,463,000	25.97	0.90	0.80	1.70	27.67	16.6	10.8	**0.0**	27.7	7.2	0.0	0.0	45.4	-10.6	27.1	0.00	
Jan	31	273,000	8,463,000	25.97	4.68	4.18	8.86	34.83	16.6	10.8	**0.0**	34.8	7.2	0.0	0.0	45.4	-3.5	23.7	0.00	
Feb	28	273,000	7,644,000	23.46	0.34	0.30	0.64	24.10	13.7	8.9	**0.0**	24.1	5.9	0.0	0.0	41.1	-11.0	12.7	0.00	
Mar	31	273,000	8,463,000	25.97	4.89	4.37	9.26	35.22	12.6	8.2	**0.0**	35.2	5.4	0.0	0.0	45.4	-4.8	7.9	0.00	
Apr	30	273,000	8,190,000	25.13	1.49	1.33	2.82	27.95	8.6	5.6	4.5	28.0	3.7	1.1	12.1	44.0	-25.5	-17.6	12.07	
May	31	273,000	8,463,000	25.97	2.23	1.99	4.22	30.19	4.6	3.0	5.9	30.2	2.0	1.5	15.8	0.0	14.9	14.9	15.80	
Jun	30	273,000	8,190,000	25.13	0.27	0.24	0.51	25.64	1.7	1.1	7.2	25.6	0.7	1.8	19.3	0.0	5.3	20.2	19.31	
Jul	31	273,000	8,463,000	25.97	0.21	0.19	0.40	26.37	1.1	0.7	8.1	26.4	0.5	2.0	21.6	0.0	3.2	23.4	21.62	21.6
Aug	31	273,000	8,463,000	25.97	0.00	0.00	0.00	25.97	1.7	1.1	7.4	26.0	0.7	1.8	20.0	0.0	4.9	28.3	19.96	
Sep	30	273,000	8,190,000	25.13	0.00	0.00	0.00	25.13	2.9	1.9	5.7	25.1	1.2	1.4	15.3	0.0	9.7	38.0	15.29	
Total					15.55	13.88	29.43	335.2	100.0	64.9	44.6	335.2	43.3	11.1	119.7	265.4	-17.6		119.7	

Average Dry Weather Flow, gal/d:	273,000	ADWF Capacity
Average Storage Pond surface area, ac	5.0	Combined surface area of existing storage pond and new 65 ac-ft pond
Total pond catchment/storage area, ac:	8.0	Combined catchment area of existing storage pond and new 65 ac-ft storage pond
Application Area, acres:	40	Total available irrigation area
Available Storage, acre-ft	109.0	With complete drawdown
	58.5	With drawdown limited to 50.6 acre-ft
Maximum Irrigation Application Rate (in/ac-yr)	35.9	
Maximum Irrigation Demand (ac-ft)	119.7	
Total Available Water (ac-ft)	367.4	Effluent + Precipitation - Evaporation
Over Irrigation ?	**Over Irrigating**	
Estimated Number of New Connections (ESFUs)	**970**	

(1) Water accumulation in storage pond begins in November.
(2) ADWF converted to acre-ft/month
(3) Calculated 1995 I/I flows. ADWF and influent flows obtained from CCWD 1995 monitoring reports.
(3.33)
(3.66)
(4) Total effluent flow is equal to the sum of the ADWF plus I/I. Column (2) + Column (3)
(5) Percent of annual rainfall total within given month.
(6) Monthly 100-yr annual precipitation values based on total annual rainfall of 64.9 inches measured at Murphys Weather Station.
(7) Evapotranspiration rates obtained from the California Irrigation Management Information System (CIMIS) for Zone 11
(8) Equal to Column (4)
(9) Precipitation inflow is equal to the product of the precipitation (5) and total pond catchment area (9.1 acres).
(10) Estimated evaporation outflow = Pan Coefficient x Shading Factor x Column (7) Storage Pond Surface Area, pan coefficient = 0.7, shading factor = 0.85. It is assumed that evapotranspiration rate is equal to evaporation rate.
(11) Wastewater outflow demand is equal to the applied wastewater (15) over 40 acres of irrigation area
(12) Volume change equals Effluent + Precipitation - Evaporation (Column 10) - Demand. Negative value represents emptying the Storage Facility. Storage Facility fills October through March.
(13) Effluent storage requirements with complete drawdown; reservoir volume assumed to contain 0 acre-ft at the beginning of October.
(14) Effluent storage requirements with drawdown limited to 50.6 acre-ft (607.2 acre-in); ; reservoir volume assumed to contain 50.6 acre-ft at the end of October.
(15) Estimated irrigation rate based on average of agronomic rates and information obtained from other local golf courses. Monthly irrigation rates are proportioned based on monthly ET values (7).

Appendix D

Comparison of Long-Term Disposal Alternatives

Comparison of Long-Term Disposal Alternatives

Sufficient irrigation sites within the community of Forest Meadows have not been identified to accommodate the long-term disposal needs projected for buildout. To rectify this situation and provide long-term guidance, two alternative disposal methods were considered in addition to expansion of existing Forest Meadows facilities. The following are descriptions of the alternatives along with the required improvements and relative construction and project costs. The improvements described below for each alternative include both the immediate improvements to accommodate current conditions and the improvements needed to accommodate projected buildout flows.

Estimated costs for collection, treatment, storage, and disposal improvements have been identified for each alternative to provide a means of comparing costs of each alternative. A summary of estimated construction and project costs for each alternative is provided in this Appendix. Costs described in this Appendix are divided into the following two categories:

- **District – Existing**. Collection, treatment, storage, and disposal improvements required to accommodate existing ESFUs
- **District – New.** Collection, treatment, storage, and disposal improvements requirement to accommodate new ESFUs.

Both types of District costs will be incorporated in the subsequent financial plan.

Alternative 1 – Maximize Forest Meadows Golf Course Irrigation and Convey Remaining Flows to the Murphys Sanitation District

Description of Alternative

The overall capacity of the existing Forest Meadows treatment plant, storage pond, and golf course irrigation sites are limited to an ADWF of 63,400 gpd.[1] The objective of this alternative is to maximize the use of existing Forest Meadows facilities and convey raw wastewater flows exceeding this capacity to the Murphys Sanitation District (MSD) for subsequent treatment and disposal. A new force main and gravity pipeline are required to convey raw wastewater to the MSD collection system. Improvements will also be required at the MSD treatment plant to accommodate the additional ADWF of 209,600 gpd attributed to Forest Meadows.

Required Improvements

Below is a summary of the major improvements required for this alternative. A timeline, describing when each of the listed improvements is required to be in service, is provided later in this Appendix.

[1] This capacity is based on the assumption that the available storage pond volume dedicated to storage of treated effluent is increased from 58.4 to 66.3 ac-ft and the catchment area is reduced from 9.1 to 8.0 acres.

- **Forest Meadows Facilities**[2]
  - **Collection System:** Collection system improvements are necessary to route flow equivalent to 145 ESFUs of existing ESFUs and all new ESFUs to the MSD treatment plant. For the purposes of this report, it is assumed that this would be accomplished by installing a new trunk sewer located near the southern boundary of Units 3 and 5. This trunk sewer would collect and convey all wastewater flows attributed to new Unit 3 and 5 to a new central lift station located in Unit 3 (as described later in this Appendix). Approximately 65 percent of the wastewater flow currently conveyed by Trunk Sewer 1 would be diverted to this new trunk sewer.

    The trunk sewer for future Unit 3 and 5 development is considered to be an in-tract improvement, and would therefore be paid for and constructed by developers.
  - **Treatment Plant:** Improvements described below are required for this alternative to provide adequate capacity for existing connections.
    1. Install one 5 and one 1 HP mechanical aerators in the Complete Mix and Settling/Sludge Storage Basins, respectively.
    2. Install two, 30 sf DAF thickeners upstream of the tertiary filters for algae removal.
  - **Storage Pond:** The improvements described below are required for this alternative to provide adequate capacity for existing connections.
    1. Reduce pond catchment area from 9.1 to 8.0 acres by diverting runoff from the southwest hillside away from the pond catchment area.
    2. Raise the pond levees approximately 2 ft, modify the pump intake and pond operation, or a combination thereof to provide a minimum volume of 66.3 ac-ft for storage of treated effluent.
  - **Golf Course:** No improvements are required.
- **Wastewater Conveyance System to MSD Treatment Plant:**
  - **MSD Export Pumping Station (Located in Unit 3)**
    1. Firm Capacity 500 gpm
    2. Estimated TDH: 50 feet
    3. Estimated Power Draw (total): 10 HP

[2] Capacity limited to 325 ESFUs or an ADWF of 63,400 gpd.

- **Raw Wastewater Pipeline**
  1. Approximate Pipe Length: Approximately 11,400 feet
  2. Estimated Pipe Diameter: 8-inch
  3. Proposed Routing: Within and/or along existing unimproved road located behind Utica Powerhouse and along Utica Ditch that connects to Unit 3 in Forest Meadows
  4. Forest Meadows Connection Point: Southern end of Unit 3
  5. MSD Connection Point: Crest View Drive, near the junction of Dam Road and Highway 4

- **MSD Treatment Plant Improvements:**
  - New trickling filter capable of treating the entire influent flow of approximately 910,000 gpd.[3]
  - Clarifier capable of treating the entire influent flow of approximately 910,000 gpd.
  - Chlorination System

Relative Costs

Table D-1 is a summary of estimate of probable construction and project costs for this alternative. Costs shown in Table D-1 (and Tables D-2, D-3, and D-4 Construction costs described in this Appendix) represent planning level costs including construction, permitting, design, construction management, and District administrative costs. As shown, the total estimated construction and project costs for this alternative are $3,285,000 and $4,355,000 based on all of the improvements listed. As shown, all of the improvements associated with this alternative are required to be in service by 2004 or 2006.

Construction costs described in Table D-1 are based on equipment cost quotes obtained from various manufacturers, past project experience, and previous reports developed for the wastewater treatment plant. A 15 percent planning level contingency is included to account for support system improvements not listed in the table.

[3] Flow rate based on the current MSD influent flow of 700,000 gpd and the Forest Meadows ADWF of 209,600 gpd.

Table D-1. Estimate of Probable Project Cost for Alternative 1

Location and Improvement	Description and Design Criteria	Estimated Cost ($)	Category and Cost Allocation			Year Improvement Required to Be In Service[b]
			District – Existing ($)	District – New ($)	Developer	
FOREST MEADOWS IMPROVEMENTS						
Collection System Improvements						
Unit 3 and 5 Trunk Sewer	Approximately 55,000 LF of 8-inch pipe	Not Included	25,000	--	Not Included	2006
Wastewater Treatment Plant						
Standby Replacement Equipment	1 and 5 HP mechanical aerators	45,000	45,000	--	--	2004
Dissolved Air Flotation (algae removal)	Add two, 30 sf units	215,000	215,000	--	--	2004
Storage Pond (Existing)						
Modify Pond Catchment Area	Reduce catchment area from 9.1 to 8.0 acres	10,000	10,000	--	--	2004
Increase Effluent Storage Capacity[a]	Provide minimum effluent storage of 66.3 ac-ft	115,000	115,000	--	--	2004
Golf Course (Irrigation Area)						
Not required	--	--			--	
WASTEWATER CONVEYANCE TO THE MSD TREATMENT PLANT						
MSD Export Lift Station						
Export Lift Station	500 gpm firm capacity	125,000	15,000	110,000	--	2006
Raw Wastewater Pipeline	Approximately 11,400 LF of 8-inch pipe	1,260,000	170,000	1,090,000	--	2006
MSD Treatment Plant Improvements						
Trickling Filter Feed Pumping Station	630 gpm firm capacity	145,000	20,000	125,000	--	2009
Trickling Filter	50 ft diameter, 10 ft deep trickling filter	525,000	70,000	455,000	--	2009
Clarifier	40 ft diameter clarifier	360,000	50,000	310,000	--	2009
Chlorination System	--	35,000	5,000	30,000	--	2009
	Subtotal A	2,860,000	740,000	2,120,000	--	
	Planning Level Contingency (15% of Subtotal A)	425,000	110,000	315,000	--	
	Estimate of Probable Construction Cost	**3,285,000**	**850,000**	**2,435,000**	**--**	
	Administrative Costs	1,050,000	270,000	780,000	--	
	Total Project Costs	**4,335,000**	**1,120,000**	**3,215,000**	**--**	

[a] Project costs are based on raising the pond levees 2 ft. Alternatively the required storage volume could be achieved by modifying the pump intake and pond operation, or a combination of raising the levees and modifying the pump intake and pond operation.

[b] Based on a 20 year requirement to reach buildout.

- District – Existing
  - Estimate of Probable Construction Cost: $850,000
  - Estimate of Probable Project Cost: $1,120,000
- District – New
  - Estimate of Probable Construction Cost: $2,435,000
  - Estimate of Probable Project Cost: $3,215,000

Alternative 2 – Golf Course Irrigation in Forest Meadows Coupled with Surface Water Discharge

Description of Alternative

Similar to Alternative 1, the objective of this alternative is to maximize the use of existing Forest Meadows facilities. The overall capacities of the treatment plant, storage pond, and irrigation areas (i.e. golf course) are limited to an ADWF of 63,400 gpd. A new pipeline is required to convey treated effluent, which exceeds the 63,400 gpd capacity, to one of the following surface waters for subsequent discharge during the wet weather season:

- **Angels Creek (Alternative 2A).** This alternative requires a new gravity pipeline, with automatic control valves to direct treated effluent to either the storage pond or Angels Creek for subsequent storage or surface water discharge. This pipeline would be tied into the existing treated effluent pipeline, which conveys treated effluent from the treatment plant to the existing storage pond, at the junction of Sandalwood Drive and Forest View Drive.
- **San Domingo Creek (Alternative 2B).** This alternative requires a new pipeline and effluent lift station to convey treated effluent to San Domingo Creek. For estimating purposes, it is assumed that the San Domingo Creek disposal pipeline would follow the alignment of the unimproved dirt road that travels from Highway 4 to San Domingo Creek (due north of Forest Meadows).
- **Stanislaus River (Alternative 2C).** This alternative would require a new effluent pipeline and lift station to convey treated effluent from the wastewater treatment plant to a nearby surge chamber located along the Collierville Tunnel. From this point, the treated effluent would be commingled with water diverted from the North Fork of the Stanislaus River and discharged to the Stanislaus River just above the New Melones Reservoir.

In all three cases, the new disposal pipelines for Alternatives 2A, 2B, and 2C would be designed to accommodate the projected buildout peak hour flow of 640 gpm. On an annual basis, approximately 77 percent of the treated effluent flow would be discharge to Angels Creek, San Domingo Creek, or to the Stanislaus River. The remaining 24 percent would be used for golf course irrigation.

Required Improvements

Below are summaries of the major improvements required for the three alternatives. A timeline, describing when the year in which each of the listed improvements is required to be in service, is also shown in these tables.

- **Forest Meadows Facilities**
  - **Collection System:** All wastewater generated in Forest Meadows would be conveyed and treated at the existing treatment plant. Therefore the following collection system improvements, described in the previous section to accommodate buildout, would be required:
    1. A new trunk sewer, located near the southern boundary of Units 3 and 5, is required to convey wastewater from new connections in these areas to Lift Station 2. This trunk sewer is considered to be an in-tract improvement and would therefore be paid for and constructed by the developers.
    2. The two existing pumps in Lift Station 2 require replacement with larger capacity units, each with a minimum capacity of 640 gpm.
  - **Treatment Plant:** The following treatment plant improvements are required for this alternative based on the projected buildout flows:
    1. Convert the existing DPMC to a higher capacity system. For the purposes of this report, it was assumed that the DPMC system would be converted to a Biolac system and a new secondary clarifier would be installed.
    2. Install two additional tertiary filters.
    3. Replace the UV system with newer UV technology with a rated peak flow capacity of 640 gpm.
  - **Treated Effluent Pipeline and Storage Pond:**
    1. Reduce pond catchment area from 9.1 to 8.0 acres by diverting runoff from the southwest hillside away from the pond catchment area.
    2. Raise the pond levees approximately 2 ft, modify the pump intake and pond operation, or a combination thereof to provide a minimum volume of 66.3 ac-ft for storage of treated effluent.
    3. Install two automatic control valves to direct the treated effluent to either the storage pond and to Angels Creek for subsequent surface water discharge. (Required for Alternative 2A only)
  - **Golf Course:** No improvements required
  - **Surface Water Conveyance System – Alternative 2A**
    1. Approximate Pipe Length: 3,700 feet

2. Estimated Pipe Diameter: 8-inch
3. Proposed Routing: Tie-in located at the intersection of Sandalwood Drive and Forest View Drive (adjacent to the storage pond). Pipeline terminus would be located near the intersection of Forest View Drive and Angel Creek Road.

- **Surface Water Conveyance System – Alternative 2B**
  1. Export Lift Station (located at Treatment Plant): Minimum design capacity of 640 gpm.
  2. Force Main Length: Approximately 10,000 feet
  3. Estimated Pipe Diameter: 8-inch
- **Surface Water Conveyance System – Alternative 2C**
  1. Export Lift Station (located at Treatment Plant): Minimum design capacity of 640 gpm.
  2. Force Main Length: Approximately 15,500 feet
  3. Estimated Pipe Diameter: 8-inch

- **Wastewater Conveyance System to MSD Treatment Plant:** Not required
- **MSD Treatment Plant Improvements:** Not required

Relative Costs

Table D-2, Table D-3, and Table D-4 show the estimate of probable construction and project costs for Alternatives 2A, 2B, and 2C, respectively. Below is a summary of the total estimated construction and project costs for Alternatives 2A, 2B, and 2C. As shown, all of the improvements associated with each alternative are required to be in service by 2004, 2006, or 2020.

- Estimate of Probable Construction Costs
  - Alternative 2A - $2,675,000
  - Alternative 2B - $3,835,000
  - Alternative 2C - $4,705,000
- Estimate of Probable Project Costs
  - Alternative 2A - $3,530,000
  - Alternative 2B - $5,060,000
  - Alternative 2C - $6,210,000

Table D-2. Estimate of Probable Project Cost for Alternative 2A

Location and Improvement	Description and Design Criteria	Estimated Cost ($)	Category and Cost Allocation			Year Improvement Required to Be In Service[a]
			District – Existing ($)	District – New ($)	Developer	
FOREST MEADOWS IMPROVEMENTS						
Collection System Improvements						
Unit 3 and 5 Trunk Sewer	60,000 LF of 8-inch pipe	Not Included	--	--	Not Included	2006
Lift Station 2 Improvements	Replace existing pumps with larger units (minimum capacity of 640 gpm, each)	45,000	--	45,000	--	2006
Wastewater Treatment Plant						
Standby Replacement Equipment	1 and 5 HP mechanical aerators	45,000	45,000	--		2004
Secondary Treatment Modifications	Conversion of DPMC to Biolac system and add aeration blowers and building	430,000	--	430,000		2020
Secondary Clarifier Addition	Install two, 30 ft diameter clarifiers	410,000	--	410,000		2020
Dissolved Air Flotation (algae removal)	Add total of two, 65 sf DAF units	390,000	195,000	195,000		2004
Dissolved Air Flotation (algae removal)	Add one additional DAF, 65 sf unit	195,000	--	195,000		2014
Tertiary Filter	Add one, 19 sf continuous backwash filter	90,000	90,000	--		2006
Tertiary Filter	Add one, 19 sf continuous backwash filter	130,000	--	130,000		2020
Replace UV System	Upgrade UV system, maximum peak flow capacity of 640 gpm	220,000	--	220,000		2006
Storage Pond (Existing)						
Modify Pond Catchment Area	Reduce catchment area from 9.1 to 8.0 acres	10,000	10,000	--		2004
Increase Effluent Storage Capacity	Provide minimum effluent storage of 66.3 ac-ft	115,000	115,000			2004
Golf Course (Irrigation Area)						
Not required						
Surface Water Conveyance System						
Angels Creek Discharge Pipeline	Approximately 3,700 LF of 8-inch pipe	245,000	35,000	210,000		2006
WASTEWATER CONVEYANCE TO THE MSD TREATMENT PLANT (Not Required)						
	Subtotal A	2,325,000	490,000	1,835,000	--	
	Planning Level Contingency (15% of Subtotal A)	350,000	75,000	275,000	--	
	Estimate of Probable Construction Cost	**2,675,000**	**565,000**	**2,110,000**	**--**	
	Administrative Costs	855,000	180,000	675,000	--	
	Total Project Costs	**3,530,000**	**745,000**	**2,785,000**	**--**	

[a] Based on a 20 year requirement to reach buildout.

Table D-3. Estimate of Probable Project Cost for Alternative 2B

Location and Improvement	Description and Design Criteria	Estimated Cost ($)	Category and Cost Allocation			Year Improvement Required to Be In Service[a]
			District – Existing ($)	District – New ($)	Developer	
FOREST MEADOWS IMPROVEMENTS						
Collection System Improvements						
Unit 3 and 5 Trunk Sewer	60,000 LF of 8-inch pipe	Not Included	--	--	Not Included	2006
Lift Station 2 Improvements	Replace existing pumps with larger units (minimum capacity of 640 gpm, each)	45,000	--	45,000		2006
Wastewater Treatment Plant						
Standby Replacement Equipment	1 and 5 HP mechanical aerators	45,000	45,000	--		2004
Secondary Treatment Modifications	Conversion of DPMC to Biolac system and add aeration blowers and building	430,000	--	430,000		2020
Secondary Clarifier Addition	Install two, 30 ft diameter clarifiers	410,000	--	410,000		2020
Dissolved Air Flotation (algae removal)	Add total of two, 65 sf DAF units	390,000	195,000	195,000		2004
Dissolved Air Flotation (algae removal)	Add one additional DAF, 65 sf unit	195,000	--	195,000		2014
Tertiary Filter	Add one, 19 sf continuous backwash filter	90,000	90,000	--		2006
Tertiary Filter	Add one, 19 sf continuous backwash filter	130,000	--	130,000		2020
Replace UV System	Upgrade UV system, maximum peak flow capacity of 640 gpm	220,000	--	220,000		2006
Storage Pond (Existing)						
Modify Pond Catchment Area	Reduce catchment area from 9.1 to 8.0 acres	10,000	10,000	--		2004
Increase Effluent Storage Capacity	Provide minimum effluent storage of 66.3 ac-ft	115,000	115,000			2004
Golf Course (Irrigation Area)						
Not required						
Surface Water Conveyance System						
San Domingo Export Lift Station	Firm capacity of 640 gpm	150,000	20,000	130,000		2006
San Domingo Creek Discharge Pipeline	Approximately 10,000 LF of 8-inch pipe	1,105,000	150,000	955,000		2006
WASTEWATER CONVEYANCE TO THE MSD TREATMENT PLANT (Not Required)						
	Subtotal A	3,335,000	625,000	2,710,000	--	
	Planning Level Contingency (15% of Subtotal A)	500,000	95,000	405,000	--	
	Estimate of Probable Construction Cost	**3,835,000**	**720,000**	**3,115,000**	**--**	
	Administrative Costs	1,225,000	230,000	995,000	--	
	Total Project Costs	**5,060,000**	**950,000**	**4,110,000**	**--**	

[a] Based on a 20 year requirement to reach buildout.

Table D-4. Estimate of Probable Project Cost for Alternative 2C

Location and Improvement	Description and Design Criteria	Estimated Cost ($)	Category and Cost Allocation			Year Improvement Required to Be In Service[a]
			District – Existing ($)	District – New ($)	Developer	
FOREST MEADOWS IMPROVEMENTS						
Collection System Improvements						
Unit 3 and 5 Trunk Sewer	60,000 LF of 8-inch pipe	Not Included	--	--	Not Included	2006
Lift Station 2 Improvements	Replace existing pumps with larger units (minimum capacity of 640 gpm, each)	45,000	--	45,000		2006
Wastewater Treatment Plant						
Standby Replacement Equipment	1 and 5 HP mechanical aerators	45,000	45,000	--		2004
Secondary Treatment Modifications	Conversion of DPMC to Biolac system and add aeration blowers and building	430,000	--	430,000		2020
Secondary Clarifier Addition	Install two, 30 ft diameter clarifiers	410,000	--	410,000		2020
Dissolved Air Flotation (algae removal)	Add total of two, 65 sf DAF units	390,000	195,000	195,000		2004
Dissolved Air Flotation (algae removal)	Add one additional, 65 sf DAF unit	195,000	--	195,000		2014
Tertiary Filter	Add one, 19 sf continuous backwash filter	90,000	90,000	--		2006
Tertiary Filter	Add one, 19 sf continuous backwash filter	130,000	--	130,000		2020
Replace UV System	Upgrade UV system, maximum peak flow capacity of 640 gpm	220,000	--	220,000		2006
Storage Pond (Existing)						
Modify Pond Catchment Area	Reduce catchment area from 9.1 to 8.0 acres	10,000	10,000	--		2004
Increase Effluent Storage Capacity	Provide minimum effluent storage of 66.3 ac-ft	115,000	115,000			2004
Golf Course (Irrigation Area)						
Not required						
Surface Water Conveyance System						
Collierville Tunnel Export Lift Station	Firm capacity of 640 gpm	150,000	20,000	130,000		2006
Collierville Tunnel Discharge Pipeline	Approximately 15,500 LF of 8-inch pipe	1,860,000	255,000	1,605,000		2006
WASTEWATER CONVEYANCE TO THE MSD TREATMENT PLANT (Not Required)						
	Subtotal A	4,090,000	730,000	3,360,000	--	
	Planning Level Contingency (15% of Subtotal A)	615,000	110,000	505,000	--	
	Estimate of Probable Construction Cost	**4,705,000**	**840,000**	**3,865,000**	**--**	
	Administrative Costs	1,505,000	270,000	1,235,000	--	
	Total Project Costs	**6,210,000**	**1,110,000**	**5,100,000**	**--**	

[a] Based on a 20 year requirement to reach buildout.

Alternative 3 – Continued Land Disposal within the Forest Meadows Community.

Description of Alternative

The objective of this alternative is to continue collecting, treating, storing, and disposing all Forest Meadows wastewater flows within the community of Forest Meadows. Therefore, the rated capacity of the collection system, treatment plant, storage, and effluent disposal facilities must be designed to accommodate all flows associated with the projected buildout ADWF of 273,000 gpd. Most of the improvements required for this alternative were discussed previously in this report.

Required Improvements

- **Forest Meadows Facilities**
  - **Collection System:** All wastewater generated in Forest Meadows would be collected and conveyed to the treatment plant. Therefore the following collection system improvements would be required:
    1. A new trunk sewer, located near the southern boundary of Units 3 and 5, is required to convey wastewater from new Unit 3 and 5 connections to Lift Station 2. This trunk sewer is considered to be an in-tract improvement and would therefore be paid for and constructed by the developers.
    2. The two existing pumps in Lift Station 2 require replacement with larger capacity units, each with a minimum capacity of 640 gpm.
  - **Treatment Plant:** The following treatment plant improvements are required for this alternative based on the projected buildout flows:
    1. Convert the existing DPMC to a higher capacity system. For the purposes of this report, it was assumed that the DPMC system would be converted to a Biolac system and a new secondary clarifier would be installed.
    2. Install two additional tertiary filters.
    3. Replace the UV system with newer UV technology with a rated peak flow capacity of 640 gpm.
    4. Install three new reclaimed water pumps with a minimum capacity of 200 gpm each.
  - **Storage Facility Improvements**: The existing storage pond does not have adequate capacity to accommodate buildout. An expansion of the existing storage pond and installation of a second pond near the treatment plant is necessary to increase the capacity from 58.4 to 181.2 ac-ft. The following is a summary of the improvements necessary for the treated effluent storage facilities.

1. The operation of the existing storage pond must be modified to provide a minimum of 101.2 ac-ft dedicated for effluent storage. This will required all or a combination of the following improvements:
    a. Pond catchment area to be reduced from 9.1 to 8.0 acres.
    b. Raise pond levees
    c. Modify pond intake
    d. Modify pond operation
2. Construct a new 80 ac-ft storage pond adjacent to the treatment plant along the southeast boundary is also required. This site has been considered in the past for both emergency and treated effluent storage (West Yost & Associates, July 1993 and James C. Hanson, March 2002). Previous studies have indicated the site appears feasible for construction of up to a 75 ft high earth or earth and rock-filled dam to accommodate a maximum of 80 ac-ft of storage capacity. The total estimated catchment area (runoff area) is estimated to be 5.5 acres (James C. Hanson, March 2002).

    A geological investigation of this site was prepared in 2001 (Taber, July 2001), which determined that the proposed same site was stable and suitable for the storage reservoir with respect to geotechnical issues.

- **Effluent Disposal Improvements:** The ADWF disposal capacity of the golf course is estimated to be 63,400 gpd, which is equal to 23 percent of the required capacity for buildout. Between 95 and 135 acres of additional irrigable land is required to accommodate buildout. This range of required land is based on a preliminary field assessment of a potential land application site conducted by Condor Earth Technologies, Inc and assumes all the land purchased is usage for effluent irrigation. According to their recommendations, the preliminary design application rate should be in the range of 25.8 to 34.9 inches per year per square area.

- **Wastewater Conveyance System to MSD Treatment Plant.** Not required
- **MSD Treatment Plant Improvements:** Not required

Relative Costs

Table D-5 is a summary of estimate of probable construction and project costs for this alternative. As shown, the total estimated construction and project costs for Alternative 3 are $13,600,000 and $17,950,000 respectively. As shown, all of the improvements associated with these two alternatives are required to be in service by 2004. 2006, or 2022.

Table D-5. Estimate of Probable Project Cost for Alternative 3

Location and Improvement	Description and Design Criteria	Estimated Cost ($)	Category and Cost Allocation			Year Improvement Required to Be In Service[a]
			District – Existing ($)	District – New ($)	Developer ($)	
FOREST MEADOWS IMPROVEMENTS						
Collection System Improvements						
Unit 3 and 5 Trunk Sewer	60,000 LF of 8-inch pipe	Not Included	--	--	Not Included	2006
Lift Station 2 Improvements	Replace existing pumps with larger units (minimum capacity of 640 gpm, each)	45,000	--	45,000		2006
Wastewater Treatment Plant						
Standby Replacement Equipment	1 and 5 HP mechanical aerators	45,000	45,000	--		2004
Secondary Treatment Modifications	Conversion of DPMC to Biolac system and add aeration blowers and building	430,000	--	430,000		2020
Secondary Clarifier Addition	Install two, 30 ft diameter clarifiers	410,000	--	410,000		2020
Dissolved Air Flotation (algae removal)	Add total of two, 65 sf DAF units	390,000	195,000	195,000		2004
Dissolved Air Flotation (algae removal)	Add one additional DAF, 65 sf unit	195,000	--	195,000		2014
Tertiary Filter	Add one, 19 sf continuous backwash filter	90,000	90,000	--		2006
Tertiary Filter	Add one, 19 sf continuous backwash filter	130,000	--	130,000		2020
Replace UV System	Upgrade UV system, maximum peak flow capacity of 640 gpm	220,000	--	220,000		2006
Reclaimed Water PS Expansion	Expand pumping station to provide a firm capacity of 640 gpm	150,000	--	150,000		
Storage Pond (Existing)						
Modify Pond Catchment Area	Reduce catchment area from 9.1 to 8.0 acres	10,000	10,000	--		2004
Increase Effluent Storage Capacity	Provide minimum effluent storage of 101.2 ac-ft	115,000	20,000	95,000		2004
Storage Pond (New)						
Construct new reservoir adjacent to plant	Minimum storage volume of 80 ac-ft	2,500,000	--	2,500,000		
Golf Course (Irrigation Area)						
Not required						
Disposal Expansion						
Purchase Land	165 acres of irrigable land[b]	875,000	120,000	755,000		
Develop Land for Effluent Disposal	165 acres of irrigable land	965,000	130,000	835,000		
Effluent Pipeline to Disposal Fields	Approximately 15,000 LF of 8-inch pipe	830,000	120,000	710,000		

Location and Improvement	Description and Design Criteria	Estimated Cost ($)	Category and Cost Allocation			Year Improvement Required to Be In Service[a]
			District – Existing ($)	District – New ($)	Developer ($)	
Surface Water Conveyance System						
Not required						
WASTEWATER CONVEYANCE TO THE MSD TREATMENT PLANT (Not Required)						
	Subtotal A	7,400,000	730,000	6,670,000		
	Planning Level Contingency (15% of Subtotal A)	1,110,000	110,000	1,000,000		
	Estimate of Probable Construction Cost	**8,510,000**	**840,000**	**7,670,000**		
	Administrative Costs	2,725,000	270,000	2,455,000		
	Total Project Costs	**11,235,000**	**1,110,000**	**10,125,000**		

[a] Based on a 20 year requirement to reach buildout.
[b] According to Condor Earth Technologies, Inc., approximately 22 percent of the proposed effluent disposal area has slopes in excess of 40 percent and is therefore inappropriate for effluent disposal. Based on this finding, it is assumed that 22 percent of the land purchased will not be suitable for effluent disposal. The land area described in this table includes the excess 22 percent.

Summary of Relative Project Costs and Recommended Approach

Table D-6 is a summary of the relative project costs and allocation of costs between the three categories. As shown, costs associated with Alternative 3 are significantly higher than the other alternatives. Based on this assessment, it is recommended that the District pursue other options for effluent disposal.

Alternative 2A is estimated to have the lowest overall project cost. It also has the lowest cost impact to existing users. Although preliminary discussions with the Central Valley RWQCB look promising, it is unknown at this time whether they will ultimately grant a surface water discharge permit to either Angels Creek, San Domingo Creek, or to the Stanislaus River. Due to this uncertainty, it is recommended that the District develop a future financial plan based on Alternatives 1 and 2C. This would provide the District with the flexibility to adjust the long-term disposal and financial strategy once a decision pertaining to surface water discharge has been made by the RWQCB. Further, it is recommended that estimated capacity charges based on Alternative 3 be developed to serve as a baseline.

Table D-6. Summary of Estimated Project Costs

Alternative	Total Project Costs ($)	Allocation of Project Costs ($)	
		District – Existing	District - New
Alternative 1 – Convey Excess Flows to MSD	4,355,000	1,120,000	3,215,000
Alternative 2A – Discharge Excess Flows to Angels Creek	3,530,000	745,000	2,785,000
Alternative 2B – Discharge Excess Flows to San Domingo Creek	5,060,000	950,000	4,110,000
Alternative 2C - Discharge Excess Flows to the Stanislaus River via the Collierville Tunnel	6,210,000	1,110,000	5,100,000
Alternative 3 – Continued Forest Meadows Disposal	11,235,000	1,110,000	10,125,000