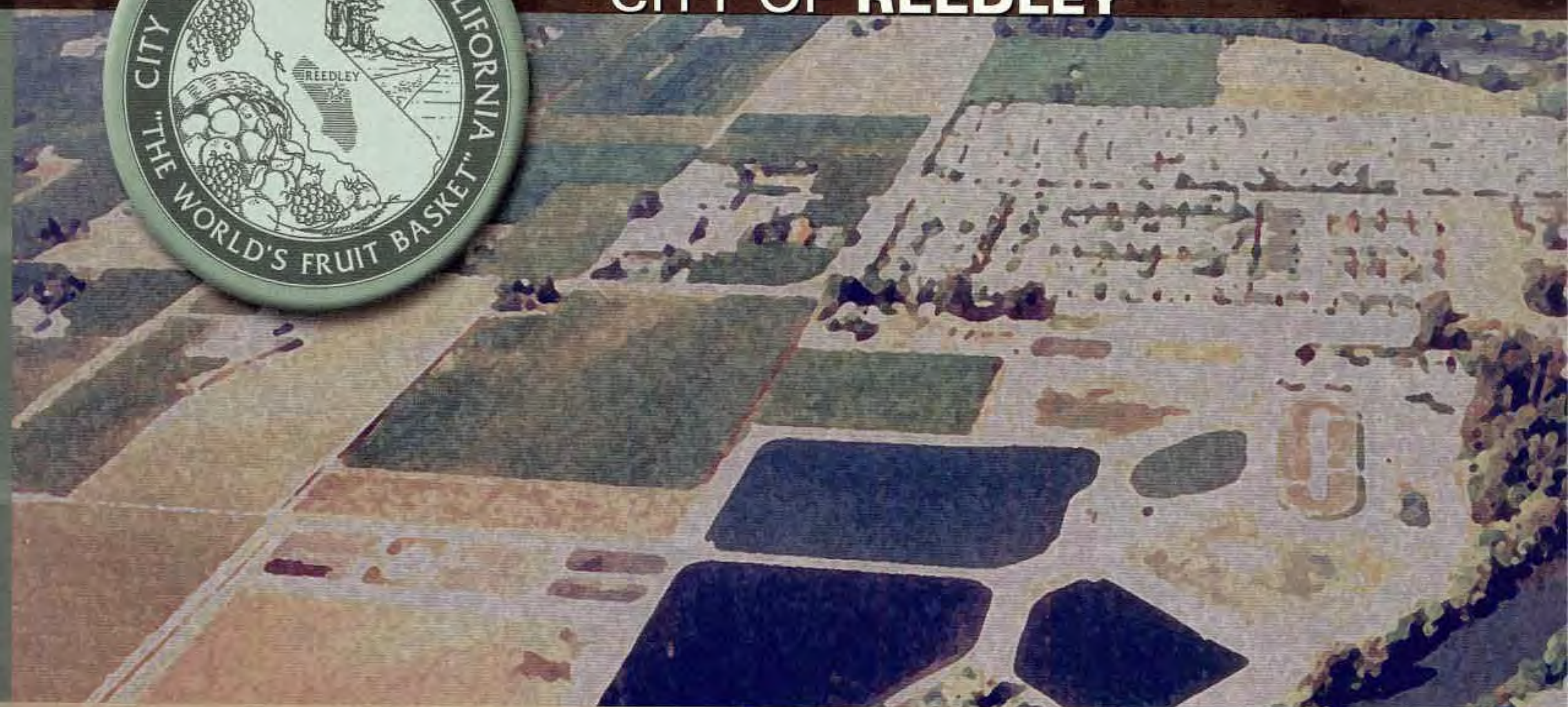
CITY OF **REEDLEY**



Wastewater Treatment Plant Master Plan

Final

carollo engineers

September 2006

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City of Reedley

WASTEWATER TREATMENT PLANT MASTER PLAN REPORT

FINAL

September 2006

carollo engineers

7580 NORTH INGRAM AVENUE, SUITE 112 • FRESNO, CALIFORNIA 93711 • (559) 436-6616 • FAX (559) 436-1191

CAROLLO ENGINEERS

DATE: September 12, 2006
SUBJECT: WWTP Master Plan - Final
WO#: 6294G.00 TO1
COPIES TO: Richard Goldstone-Reedley, Penny Carlo-FNO, David Stringfield-FNO, Leon Allen-SLC, Lou Carella-WCO, Wing Lee (SWRCB); Dale Harvey (RWQCB)

7580 N. INGRAM AVENUE, SUITE 112
FRESNO, CALIFORNIA 93711
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TRANSMITTAL FORM

ADDRESS: City of Reedley
1733 Ninth Street
Reedley, California 93654

ATTENTION: Mr. Rocky Rogers

THE FOLLOWING ITEMS ARE:

- ☐ REQUESTED
- ☒ ENCLOSED
- ☐ SENT SEPARATELY
- ☐ REPORT
- ☐ TEST RESULT
- ☐ SPECIFICATION
- ☐ COST ESTIMATE
- ☐ CHECK PRINT
- ☐ PROGRESS EST.
- ☐ CALCULATIONS
- ☐ OTHER

VIA: Express delivery

NO. OF COPIES	DESCRIPTION
3	New cover and spines -Wastewater Treatment Plant Master Plan – Final
3	New inside cover page
3	Transmittal page

THESE DATA ARE SUBMITTED:

- ☐ AT YOUR REQUEST
- ☐ FOR YOUR APPROVAL
- ☐ FOR YOUR REVIEW
- ☐ FOR YOUR ACTION
- ☒ FOR YOUR FILES
- ☐ FOR YOUR INFORMATION

Enclosed are three sets of replacement covers for the three WWTP Final Draft Master Plan binders that you have. A separate set of replacement covers has been made for Richard's binder and are being sent to him separately.

By switching out the binder cover, spine, and the inside cover page with these new covers, the document is now the Final Report. Also, insert this transmittal into the report behind the new inside cover page, to provide documentation on the date as which this revision has been completed. We are hole-punching the two inside pages for you. We are not making any changes to the text of the report, so those pages do not need to be replaced.

If you need additional sets, please let me know.

Sincerely,

CAROLLO ENGINEERS, P.C.

Penny Carlo

By: Penny Carlo

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Carollo Engineers

Dedicated to creative, responsive, quality solutions for those we serve.

January 18, 2006
6294G.00 TO1

City of Reedley
1733 Ninth Street
Reedley, CA 93654

Attention: Mr. Rocky Rogers, Public Works Director

Subject: Wastewater Treatment Plant Master Plan Final Draft for Environmental Review

Dear Mr. Rogers:

Enclosed is the Wastewater Treatment Plant Master Plan Final Draft for Environmental Review for the City of Reedley Wastewater Treatment Plant (WWTP), prepared by Carollo Engineers, P.C.

The City is expected to grow during the current planning period at a growth rate of four percent. By the year 2030, the projected population will be slightly over 60,000, from a current population of 22,623. The annual average daily flow is projected to be 6.03 million gallons per day (mgd). The maximum month average daily flow is projected to be 6.88 mgd and the peak hour flow is projected to be 15.08 mgd.

The Reedley WWTP currently operates under Waste Discharge Requirements (WDRs) issued by the Regional Water Quality Control Board (RWQCB). Reedley's WDR contains numeric and narrative limits for the WWTP effluent, the Kings River, and the groundwater beneath the WWTP boundary.

Four alternatives were considered for expanding the WWTP. All of them would be designed to remove nitrogen to comply with anticipated future regulatory requirements. Based upon the projected population and wastewater flows, it was recommended the WWTP be expanded to handle 7.0 mgd. The construction cost for the recommended 7.0 mgd plant upgrades is $22,997,000. Adding in a 35 percent markup to cover engineering, planning, inflation, administration, legal, and contingencies, the total project cost is estimated at $31 million.

Based on wastewater flow projections, it is recommended that the City build this project in phases. The City should implement a 5.0 mgd Phase 1 Project, which would provide sufficient capacity through the year 2022. As maximum month flows approach 5.0 mgd, between the years of 2015 and 2020, the City would begin planning, design, and construction of the facilities to provide 7.0 mgd capacity.

The principal difference between the 5.0 mgd Phase 1 Project and the 7.0 mgd Recommended Project is that only one of the two oxidation ditches, and two of three secondary clarifiers will be constructed as part of the Phase 1 Project. The construction cost for the Phase 1 Project is estimated at $18,538,000. The total project cost, after adding

35 percent for engineering, planning, inflation, administration, legal and contingencies is estimated at $25,026,300. The construction and project costs are shown in the attached table.

Carollo appreciates the opportunity to assist the City of Reedley on this important project. If you have any questions, please do not hesitate to call.

Sincerely,

CAROLLO ENGINEERS, P.C.

David Stringfield (pc)

David L. Stringfield, P.E.

Penny Carlo

Penny Carlo, P.E.

DLS/PLC:dlo

Enclosures: Table 1 - 5.0 mgd Phase 1 Project Construction and Project Costs

Table 1 **5.0 mgd Phase 1 Project - Opinion of Probable Costs**
Wastewater Treatment Plant Master Plan
City of Reedley

Item	5 mgd Project Construction Cost (1)	5 mgd Project Project Cost
10 mgd Headworks	$1,075,000	$1,451,250
Vactor Truck Dump Station	73,000	98,550
Secondary Treatment Flow Splitter Box	114,000	153,900
Oxidation Ditch	2,500,000	3,375,000
Existing Ditch Upgrades and Anoxic Basin	1,584,000	2,138,400
Mixed Liquor Splitter Box	114,000	153,900
Secondary Clarifiers Two New and Rehab Existing	2,900,000	3,915,000
RAS/WAS Pump Station	825,000	1,113,750
Effluent Pump Station	700,000	945,000
Aerated Sludge Holding Tank	1,411,000	1,904,850
Centrifuge Building	2,615,000	3,530,250
Existing RAS/WAS Pump Station Upgrades	258,000	348,300
Non-Potable Water System	258,000	348,300
Sodium Hypochlorite System	386,000	521,100
Administration Building	750,000	1,012,500
Maintenance Building	400,000	540,000
Administration/Laboratory Building Remodel	300,000	405,000
Standby Generator	500,000	675,000
Electrical Manhole near Headworks	25,000	33,750
RAS Pump Station Electrical Repairs	50,000	67,500
Demolition Plant No. 1	900,000	1,215,000
Demolition Plant No. 2	200,000	270,000
Demolition of Headworks and Effluent Pump Station	500,000	675,000
New Potable Water Supply	100,000	135,000
	$18,538,000	$25,026,300

(1) 2005 Construction Costs: Estimated bid price is $20 million, based on midpoint of construction. Construction cost escalation has been included in the Project cost.

City of Reedley

WASTEWATER TREATMENT PLANT MASTER PLAN REPORT

FINAL DRAFT FOR ENVIRONMENTAL REVIEW

January 2006

7580 NORTH INGRAM AVENUE, SUITE 112 • FRESNO, CALIFORNIA 93711 • (559) 436-6616 • FAX (559) 436-1191
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City of Reedley

WASTEWATER TREATMENT PLANT
MASTER PLAN REPORT

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1. "Reasonable Potential Analysis", prepared by Carollo Engineers, P.C., for the City of Reedley, June 2003.

2. "Work Plan for the Determination of BPTC (Non-surface water Discharge), prepared by Carollo Engineers, P.C., for the City of Reedley, August 2002.

3. "Work Plan for the Determination of Constituents of Concern for Best Practicable Treatment and Control (BPTC), prepared by Carollo Engineers, P.C., for the City of Reedley, October 2003.

4. Groundwater Assessment Wastewater Treatment Facility", prepared by Carollo Engineers and Kenneth D. Schmidt and Associates for the City of Reedley, August 2001.

5. "Hydrogeologic Conditions in the Vicinity of the City of Reedley WWTF", prepared by Kenneth D. Schmidt and Associates for the City of Reedley, July 2002.

EXECUTIVE SUMMARY

ES.1 INTRODUCTION

The City of Reedley (City) Wastewater Treatment Plant (WWTP) is located in the southwest part of the City along the Kings River. There are three plants located on a common site. Plant No. 1 consists of imhoff tanks, a trickling filter, a clarifier, and an effluent storage tank. Plant No. 2 consists of a primary clarifier, a trickling filter, a secondary clarifier and an anaerobic digester. Both of these plants are no longer in use. Plant No. 3 consists of an oxidation ditch, secondary clarifiers, disinfection facilities, and other support facilities.

The purpose of this study is to develop a facilities plan for treatment of the City's wastewater for the 20-year planning period from 2010 (start of operation) through 2030. The planned facilities must comply with the discharge requirements of the California Regional Water Quality Control Board-Central Valley Region (RWQCB).

ES.2 EXISTING AND PROJECTED SERVICE AREA

The service area of the Reedley WWTP is essentially the incorporated limits of the City. The City is expected to grow during the current planning period at a growth rate of four percent. Recent growth has been at much lower rates due to moratorium to allow the City time to complete the Reedley Specific Plan. It is anticipated now that the moratorium has been lifted that here will be an increase in the growth rate of the City. By the year 2030, the projected population will be slightly over 60,000, from a current population of 22,623.

ES.3 HISTORICAL PROJECTED FLOWS AND LOADINGS

An analysis of the plant's historical data was made to determine flow and loading factors for projecting future flows and loadings. The design of wastewater treatment plants is generally based on the maximum month average daily (MMAD) flows. Using this approach the WWTP will have the capacity to treat the wastewater from the maximum month conditions as well as the average month.

The historical maximum month average daily flow to annual average daily flow factor was found to be 1.14. This value is used for the projections herein. The peak hour to annual average daily flow factor was found to be 2.16 based upon a storm event on December 31, 2004. However, the plant flow meter could not record the actual maximum flow because it exceeded its range. Therefore, a factor of 2.5 is used in this report.

A value of 100 gallons per capita per day is used in this study. With the projected 2030 population of 60,310, the annual average daily flow is projected to be 6.03 million gallons per day (mgd). The maximum month average daily flow is projected to be 6.88 and the peak hour flow is projected to be 15.08 mgd.

Historical influent BOD_5 loading was found to average 157 mg/L. Peak month loading was found to be 177 mg/L or 1.13 times greater. The projected BOD_5 loadings are estimated to be 10,900 pounds per day for the peak month. Historical influent TSS loading was found to average 186 mg/L. Peak month loading was found to be 216 mg/L or 1.16 times greater. The projected TSS loadings are estimated to be 12,600 pounds per day for the peak month. The 2030 nitrogen load is projected to be 1,435 pounds per day.

A review of the plant's biosolids production was made. The average projection rate was found to be 1159 pounds per 1 mgd.

ES.4 EXISTING AND FUTURE REGULATORY REQUIREMENTS

The Reedley WWTP currently operates under Waste Discharge Requirements (WDRs) issued by the Regional Water Quality Control Board (RWQCB). Reedley's WDR contains numeric and narrative limits for the WWTP effluent, the Kings River, and the groundwater beneath the WWTP boundary.

In terms of effluent requirements, discharge to the percolation ponds requires less stringent effluent limits compared to what is required to discharge to the Kings River. In terms of receiving waters, there are numeric limits for both the Kings River and the groundwater to protect beneficial uses. The RWQCB has indicated to the City that a total nitrogen limit on the effluent is likely to be established in the City's future WDR, to protect the underlying groundwater. It is expected the limit will be 10 mg/L for total nitrogen.

Discharge to the Kings River requires continuation of the NPDES permit, which is a federal permit. The WWTP has not discharged to the River since 1998, and percolation pond capacity is adequate for current and future flows. Therefore, it is recommended the WWTP discontinue the option to discharge to the Kings River, thereby eliminating the NPDES permit from the City's WDR. The discharge option is simply not needed, and it is economically advantageous to eliminate the NPDES permit.

Reedley's effluent meets undisinfected secondary criteria based upon California Code of Regulations Title 22. The effluent can be used to irrigate fodder, fiber, and seed crops. In order to irrigate vineyards, orchards, landscaping or golf courses, the effluent must be treated to disinfected tertiary levels.

Currently, the Reedley WWTP disposes of biosolids by having a permitted land applier, McCarthy Farms, load, haul, compost and spread the biosolids on agricultural land in Kings County. The biosolids must be composted because the WWTP process does not treat the biosolids to the "Class A" level of pathogen destruction that is required for direct land application in Kings County. Fresno, Kings, Kern and Riverside Counties have passed ordinances banning land application of biosolids that have not been treated to Class A standards. It does not appear to be cost effective for Reedley to produce Class A biosolids on-site, prior to off-site land application.

The San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) issues the emissions permit for the WWTP. Prohibitory Rules applicable to major treatment plant operations include emission limits for conventional pollutants (NOx, SOx, CO, VOCs), nonconventional pollutant (i.e. metals), visible emissions, odors (nuisance), fugitive dust emissions, and particulates. At the Reedley WWTP, the source of conventional air contaminants is predominantly derived from the operation of the standby generator, which is fueled by diesel fuel. The standby generator is only used occasionally. Other sources of contaminants are derived from fugitive emissions from the wastewater processes.

ES.5 EFFLUENT REUSE EVALUATION

The City's percolation practice continues to be the recommended approach for effluent reclamation. The City does not need any additional ponds until flows exceed 4.69 mgd. If flows increase as projected in Chapter 3, this will occur around the years 2020 to 2025. Prior to reaching the 4.69 mgd pond capacity, the City will need to construct an additional 18-acre percolation pond to provide capacity for an ultimate design flow of 6.88 mgd.

The proposed upgrade to the WWTP will treat the wastewater to undisinfected secondary level (current level of treatment). Effluent recycling does not appear to be feasible at this time to justify a higher level of treatment. Based on previous studies, the costs to upgrade to tertiary levels and deliver the effluent to neighboring orchards and vineyards would be approximately $5.6 million for today's flows (2.5 mgd). Disinfection costs would be additional.

Five alternatives for effluent recycling that had been previously studied were reviewed. The alternatives are all infeasible and impractical, as was concluded in 1997: The first three alternatives (direct irrigation on privately owned orchards and vineyards, discharge to Consolidated Irrigation District, and landscape irrigation) all require disinfected tertiary effluent, at the construction costs mentioned above. The fourth alternative (discharge to UC Kearney Ag Field Station) is infeasible, due to lack of interest by the UC. The fifth alternative (irrigating undisinfected secondary effluent on City-owned farmland) would require significantly high capital costs for land purchase.

ES.6 POTENTIAL FOR REGIONALIZATION

A conceptual level evaluation of the potential benefits to building a regional wastewater treatment plant to serve Reedley and neighboring communities of Parlier, Cutler-Orosi, and Dinuba, was provided. Due to the length of time that would be needed to develop, build, and implement regional facilities, the concept is evaluated in the context of handling future flows beyond 2030 and to the year 2045.

It is assumed the wastewater treatment facilities would need to treat the wastewater to disinfected tertiary quality, for unrestricted use. Planning level costs are $238 million for construction of the facilities, plus $50 to $90 million for new trunk sewers.

There are also significant issues that would need to be addressed. Key issues involve technical, institutional/financial, and public involvement aspects. About 15 –20 years would be needed for these planning efforts prior to acquiring a site and beginning design.

Due to the significant capital costs, time, effort, and cooperative planning that would be needed; a regional plant is not feasible for near term or long term planning horizons.

ES.7 EXISTING WASTEWATER TREATMENT FACILITIES

There are three separate treatment plants located on a common site. Plant Nos. 1 and 2 have been abandoned. Plant No. 3 is the City of Reedley's current treatment facility. It consists of a headworks with a rotary screen and flow metering, an oxidation ditch, two secondary clarifiers, RAS and WAS pumping, and effluent pumping. All of the facilities are well maintained. However, there are some modifications and improvements that have been identified.

It is recommended that a new headworks facility be constructed due to the age and limited capacity of the existing facility. Because of the need for nitrogen removal, anoxic basins ahead of the oxidation ditch will be required. Because of the length of time the RAS and WAS pumps have been in service, they should be overhauled and reconditioned. This would also include the valves, meters, and other appurtenances. The effluent screw pumps have also been in service for over 20 years. Consideration should be given to replacing these pumps with centrifugal pumps with greater capacity. It is recommended that the underdrain pipe between Percolation Ponds 2 and 3 be severed and plugged similar to the pipe between ponds 1 and 2.

If the City decides to keep the option of discharging to the Kings River, there are some minor items that need to be repaired at the Filtered Effluent Pump Station. These include the refurbishment or replacement of isolation valves and gates. If this disposal option is discontinued, as recommended in Chapter 4, the pump station could be demolished. The chlorination and dechlorination equipment should be evaluated due to its age and infrequent use. These facilities could also be demolished if the Kings River discharge option is discontinued.

It is recommended that a new aerated sludge holding tank be installed upstream of the centrifuges. This would allow the operation of the sludge wasting to be separated from the dewatering operation. Consideration should also be given about the remaining life of the centrifuges. As the flow to the plant increases, there will be increased dewatering. This can be handled with longer running times or larger equipment. An investigation should be made as to whether larger centrifuges can fit within the existing building.

Other improvements that are recommended include the non-potable water system, the size of the potable water line to the plant, and expanded laboratory space. A new administration building is also recommended. The fuel tank for the standby generator should be replaced with a double contained tank. A detailed investigation of the plant electrical system should be made.

ES.8 PRELIMINARY TREATMENT EVALUATION

The processes included in the preliminary treatment evaluation include screening, flow metering, sampling, and grit removal. All of these processes are based on hydraulics and must be able to efficiently handle the peak hourly flows. Wastewater treatment, effluent disposal and biosolids handling alternatives are evaluated in following chapters.

It is common and appropriate for headworks facilities be sized for the projected flows for a 40-year planning period. Therefore, the peak hour design flow is 25 mgd. The new headworks is recommended to be located at the Plant No. 1 site. The facilities would include screening sampling, and metering. Grit removal can be included as desired.

Two mechanical bar screens are recommended. Each would have capacity for half of the design flow. A manually cleaned bar screen would be provided for emergency situations. Two vortex grit removal chambers are recommended if grit removal is included. It is also recommended that a dump station be provided for the vactor truck that the City is considering buying. The estimated cost of the new headworks facility is $2,021,000. The cost without grit removal is $1,148,000.

ES.9 SECONDARY TREATMENT EVALUATION

Four alternatives are considered for expanding the City's wastewater treatment plant. These are 1) the trickling filter process; 2) the sequencing batch reactor process; 3) membrane reactors; and 4) extended aeration process. All of these alternatives would be designed to remove nitrogen to comply with anticipated future regulatory requirements.

The effluent quality from a trickling filter plant is not as high a quality as the other alternatives and is not a recommended process for nitrification/denitrification. In addition, there are more supporting treatment facilities, i.e. primary clarifiers, anaerobic digesters, etc., required. Finally, trickling filters have a history of producing odors. Therefore, this alternative is not recommended for the City of Reedley.

The sequencing batch reactor (SBR) process has generally been associated with small plants. This process requires extensive automation to sequence the various basins and provide for continuous flow. In addition, it would be a new process for the plant staff to learn. The SBR process would require the operation of two different plants. Therefore, this alternative is not recommended.

The third alternative considered is membrane bioreactors (MBR). This is the most expensive alternative. The capital cost is estimated to be between $17 and 20 million. It does produce the highest quality of water that complies with Title 22 unrestricted use requirements. However, because of its higher costs and not needing to produce Title 22 water, the MBR process is not recommended for the plant expansion.

The fourth alternative is the extended aeration process of which an oxidation ditch is typical. The estimated capital cost for two oxidation ditches, three secondary clarifiers, and a RAS pump station is $9,839,000. Additional facilities that would be required are rehabilitation of the existing oxidation ditch and a new effluent pump station. These two facilities would add approximately another $2.5 million. This is the recommended alternative to expand the Reedley wastewater treatment plant at a total capital cost of $12,232,000. The plant staff is familiar with the process and it will not add any complexity to operating the plant.

ES.10 BIOSOLIDS TREATMENT AND REUSE EVALUATION

Due to the uncertainties associated with land application of biosolids in California and the Central Valley, it is recommended that the City take a wait-and-see attitude relating to biosolids stabilization. During this time it is recommended that the City continue to dewater the WAS and truck it to the San Joaquin Composting Facility for further processing. As regulations change and become less dynamic the City can re-evaluate their biosolids treatment options. Expanding the current operation presents the least risk since it can likely be incorporated into any future biosolids treatment process the City may engage in.

Heat drying will likely be the preferred on-site biosolids treatment in the near future in the Central Valley. The expanded centrifuge dewatering facility can be used in conjunction with the heat drying process. With heat drying no additional or immediate step is required between the dewatering (centrifuges) and the heat drying process. Adopting this wait-and-see position will allow the City to easily incorporate heat drying when it becomes required or, beneficial.

When the biosolids trends become better defined, and the City chooses to investigate Class 'A' further, it is recommended that pilot testing or a demonstration project for composting and/or heat drying be further evaluated. The evaluations should include operating costs, capital costs, product quality, product quantity, marketability, potential for odors, and other factors.

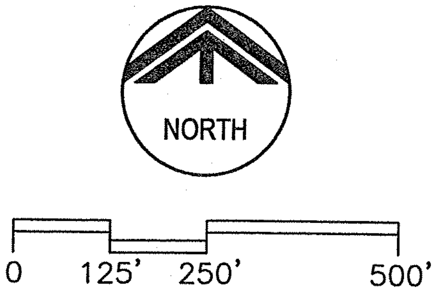
Odors are a primary concern at the WWTP. The recommended biosolids dewatering facilities include expanding the centrifuge dewatering by adding another centrifuge building. This is the best option to assure a continuation of the City's objective to minimize odors from the plant. In addition to the added centrifuges, an aerated sludge holding tank should be added. The opinion of probable capital costs for the biosolids treatment facilities is $4,026,000.

ES.11 SUPPORT FACILITIES

Improvements that are needed in other areas of the treatment plant that are not specifically covered in the preceding chapters have been identified. These areas include the improvements and expansion of the scum beds, improvements to the existing RAS/WAS Pump Station, improvements to the non-potable water system, addition of a sodium hypochlorite system, enlarging the potable water system connection, miscellaneous improvements, new administration building, new shop, remodeling of the existing laboratory, additional percolation ponds, and demolition of Plants 1 and 2. The estimated cost for these improvements is $6,141,000. Without the percolation ponds, which are not needed until flows read 4.7 mgd, the total cost is $5,491,000.

ES.12 RECOMMENDED PROJECT

Based upon the projected population and wastewater flows, it is recommended that the Reedley Wastewater Treatment Plant be expanded to handle 7.0 mgd. In addition, the treatment scheme is recommended to be upgraded to remove nitrogen so that the total nitrogen in the effluent will be below 10 mg/L. A preliminary site plan for the recommended project is shown in Figure ES.1. A summary of the design criteria for the recommended plant upgrades are shown in Table ES.1. The construction cost for the recommended project is estimated at $22,897,000, as shown in Table ES.2. The total project cost, after adding 35 percent for engineering, planning, inflation, administration, legal and contingencies is estimated at $31 million.

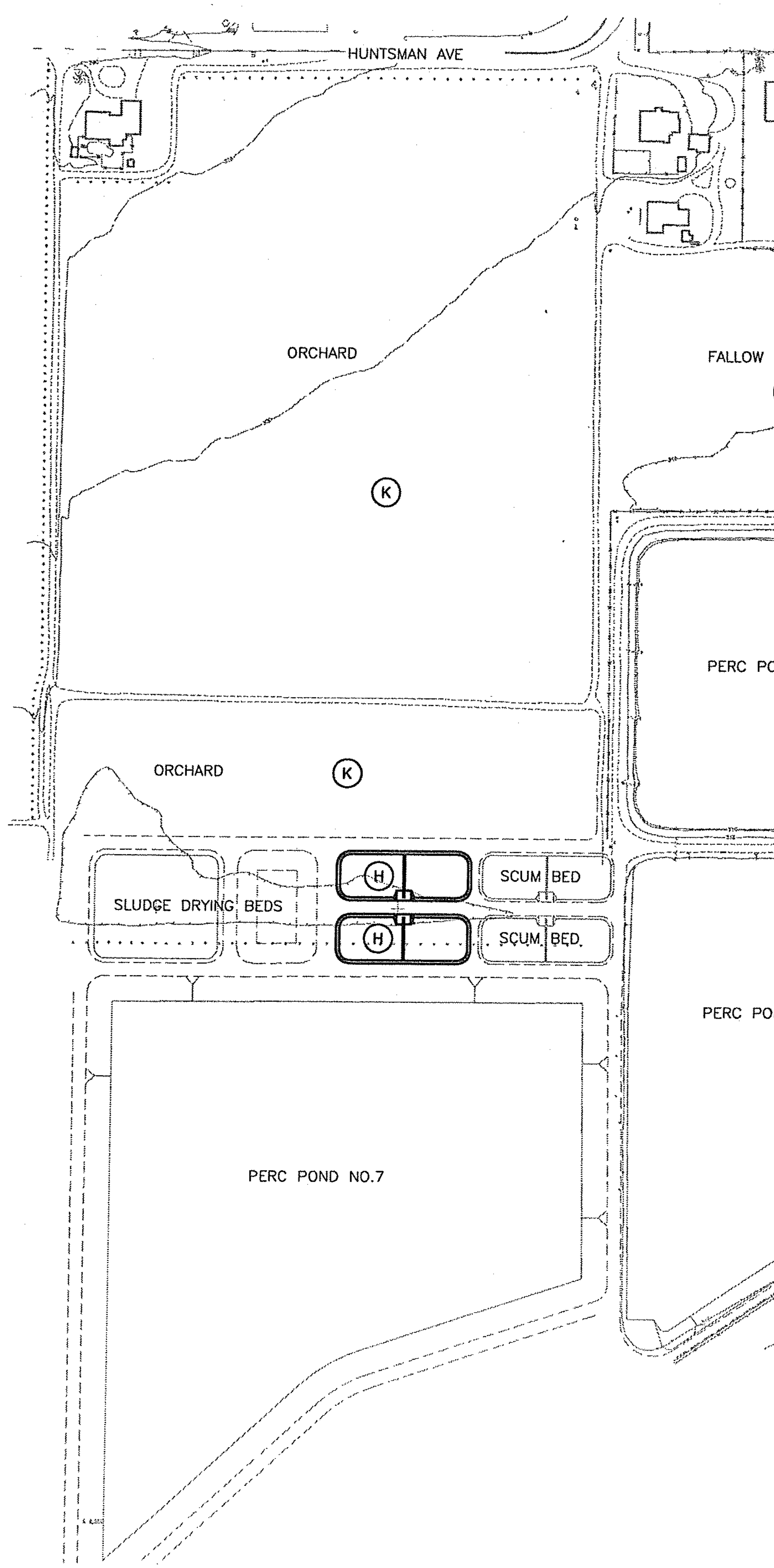


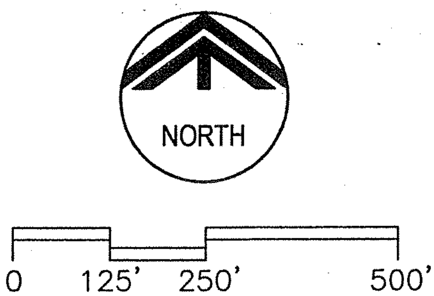
EXISTING FACILITIES

1. EFFLUENT PUMP STATION (DEMOLISH)
2. SECONDARY CLARIFIER (DEMOLISH)
3. TRICKLING FILTER (DEMOLISH)
4. PRIMARY CLARIFIER (DEMOLISH)
5. OPERATION BUILDING
6. DIGESTER, GENERATOR AND MAINTENANCE BLDG
7. HEADWORKS (DEMOLISH)
8. IMHOFF TANK (DEMOLISH)
9. OXIDATION DITCH (REHABILITATE)
10. FILTERED EFFLUENT PUMP STATION
11. CHLORINE MIXING BASIN
12. CHLORINATION/ DECHLORINATION BLDG
13. CHLORINE CONTACT BASINS
14. SLUDGE DEWATERING FACILITIES

RECOMENDED FACILITIES

- (A) HEADWORKS
- (B) GRIT CHAMBER (FUTURE)
- (C) SPLITTER BOX
- (D) OXIDATION DITCHES
- (E) SECONDARY CLARIFIERS (3)
- (F) RAS/WAS PUMP STATION
- (G) ADMINISTRATION BUILDING AND MAINTENANCE BUILDING
- (H) SCUM BEDS
- (I) CENTRIFUGE BUILDING
- (J) AERATED SLUDGE STORAGE TANK
- (K) PERCOLATION PONDS (FUTURE)
- (L) OXIDATION DITCHES (FUTURE)
- (M) SECONDARY CLARIFIERS (FUTURE)
- (N) EFFLUENT PUMP STATION
- (O) ANOXIC BASIN





EXISTING FACILITIES

1. EFFLUENT PUMP STATION (DEMOLISH)
2. SECONDARY CLARIFIER (DEMOLISH)
3. TRICKLING FILTER (DEMOLISH)
4. PRIMARY CLARIFIER (DEMOLISH)
5. OPERATION BUILDING
6. DIGESTER, GENERATOR AND MAINTENANCE BLDG
7. HEADWORKS (DEMOLISH)
8. IMHOFF TANK (DEMOLISH)
9. OXIDATION DITCH (REHABILITATE)
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11. CHLORINE MIXING BASIN
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13. CHLORINE CONTACT BASINS
14. SLUDGE DEWATERING FACILITIES

RECOMENDED FACILITIES

- (A) HEADWORKS
- (B) GRIT CHAMBER (FUTURE)
- (C) SPLITTER BOX
- (D) OXIDATION DITCHES
- (E) SECONDARY CLARIFIERS (3)
- (F) RAS/WAS PUMP STATION
- (G) ADMINISTRATION BUILDING AND MAINTENANCE BUILDING
- (H) SCUM BEDS (FUTURE)
- (I) CENTRIFUGE BUILDING
- (J) AERATED SLUDGE STORAGE TANK
- (K) PERCOLATION PONDS (FUTURE)
- (L) OXIDATION DITCHES (FUTURE)
- (M) SECONDARY CLARIFIERS (FUTURE)
- (N) EFFLUENT PUMP STATION
- (O) ANOXIC BASIN

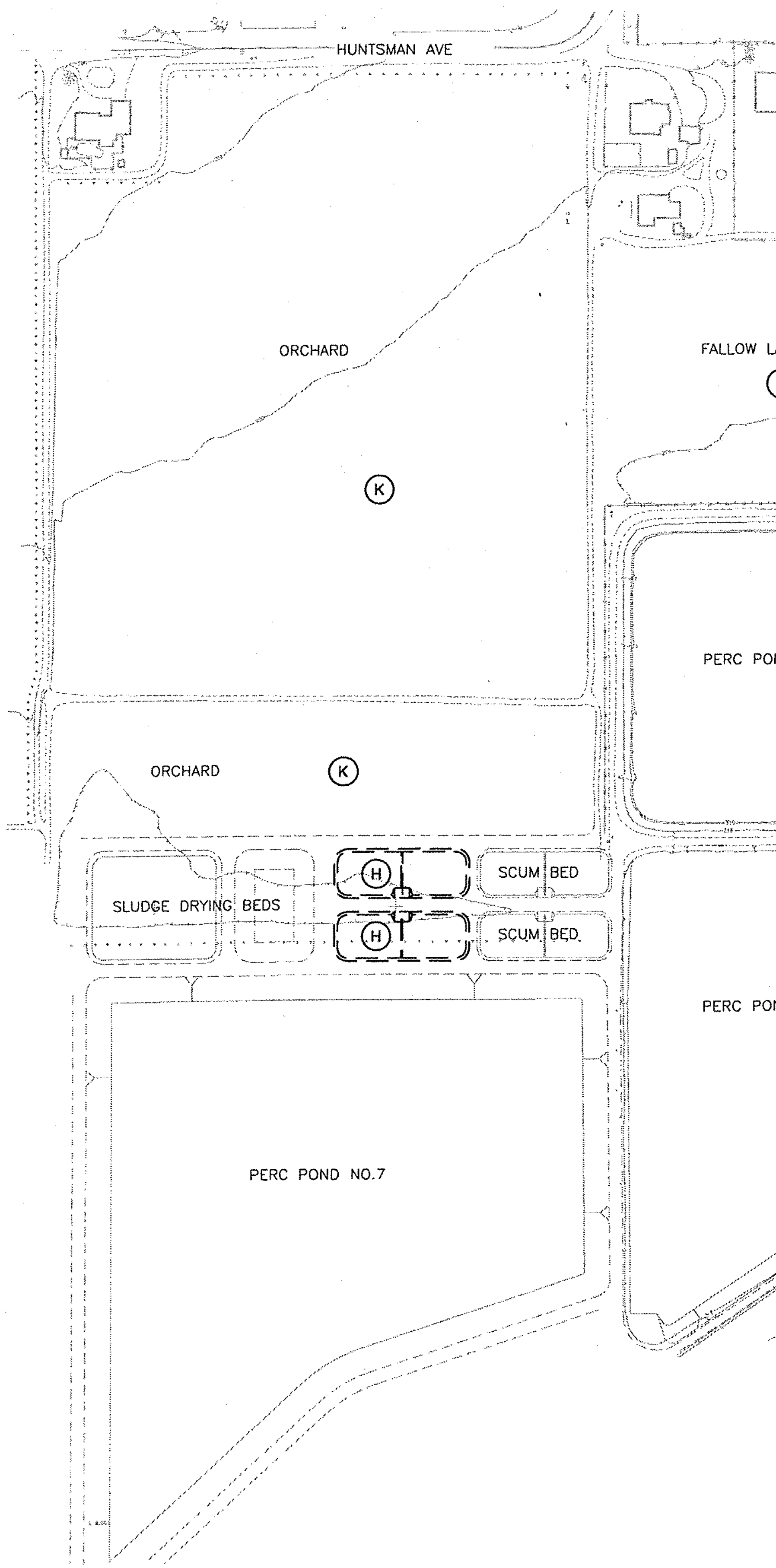

Table ES.1 Design Criteria for Recommended Project
Wastewater Treatment Plant Master Plan
City of Reedley

Component	Design Criteria
Annual Average Daily (AAD) Flow	6.03 mgd
Maximum Month Average Day (MMAD) Flow	6.88 mgd
Peak Hour (PH) Flow	15.08 mgd
PH Flow (2045)	25.00 mgd
MMAD BOD_5 Concentration	190 mg/L
MMAD BOD_5 Loading	10,902 ppd
MMAD TSS Concentration	220 mg/L
MMAD TSS Loading	12,623 ppd
Total Kjeldahl Nitrogen (TKN) Concentration	25 mg/L
TKN Loading	1,435 ppd

Table ES.2 Opinion of Probable Construction Cost of Recommended Project
Wastewater Treatment Plant Master Plan
City of Reedley

Component	Cost
Headworks and Vactor Truck Dump Station	$1,148,000
Secondary Treatment Facilities	12,232,000
Biosolids Treatment	4,026,000
Support Facilities	5,491,000
Total Construction Cost	**$22,897,000**

Based on wastewater flow projections, it is recommended that the City build this project in phases. The City should implement a 5.0 mgd Phase 1 Project, which would provide sufficient capacity through the year 2022. A preliminary site plan for the 5.0 mgd Phase 1 Project is shown in Figure ES.2. As shown in Figure ES.2, the principal difference between the 5.0 mgd Phase 1 Project and the 7.0 mgd recommended Project is that only one of two oxidation ditches and two of three secondary clarifiers will be constructed as part of the Phase 1 Project.

Table ES.3 provides a list of facilities that will be built in Phase 1. The table also itemizes the construction and project cost of each element. The construction cost for the Phase 1 Project is estimated at $18,538,000. The total project cost, after adding 35 percent for engineering, planning, inflation, administration, legal, and contingencies is estimated at $25,026,300.

Table ES.3 5.0 mgd Phase 1 Project - Opinion of Probable Costs
Wastewater Treatment Plant Master Plan
City of Reedley

Item	5 mgd Project	
	Construction Cost (1)	Project Cost
10 mgd Headworks	$1,075,000	$1,451,250
Vactor Truck Dump Station	73,000	98,550
Secondary Treatment Flow Splitter Box	114,000	153,900
Oxidation Ditch	2,500,000	3,375,000
Existing Ditch Upgrades and Anoxic Basin	1,584,000	2,138,400
Mixed Liquor Splitter Box	114,000	153,900
Secondary Clarifiers Two New and Rehab Existing	2,900,000	3,915,000
RAS/WAS Pump Station	825,000	1,113,750
Effluent Pump Station	700,000	945,000
Aerated Sludge Holding Tank	1,411,000	1,904,850
Centrifuge Building	2,615,000	3,530,250
Existing RAS/WAS Pump Station Upgrades	258,000	348,300
Non-Potable Water System	258,000	348,300
Sodium Hypochlorite System	386,000	521,100
Administration Building	750,000	1,012,500
Maintenance Building	400,000	540,000
Administration/Laboratory Building Remodel	300,000	405,000
Standby Generator	500,000	675,000
Electrical Manhole near Headworks	25,000	33,750
RAS Pump Station Electrical Repairs	50,000	67,500
Demolition Plant No. 1	900,000	1,215,000
Demolition Plant No. 2	200,000	270,000

Table ES.3 5.0 mgd Phase 1 Project - Opinion of Probable Costs
Wastewater Treatment Plant Master Plan
City of Reedley

Item	5 mgd Project Construction Cost [(1)]	Project Cost
Demolition of Headworks and Effluent Pump Station	500,000	675,000
New Potable Water Supply	100,000	135,000
	$18,538,000	$25,026,300

(1) 2005 Construction Costs: Estimated bid price is $20 million, based on midpoint of construction. Construction cost escalation has been included in the Project cost.

INTRODUCTION

1.1 SUMMARY

The City of Reedley (City) Wastewater Treatment Plant (WWTP) is located in the southwest part of the City along the Kings River. There are three plants located on a common site. Plant No. 1 consists of imhoff tanks, a trickling filter, a clarifier, and an effluent storage tank. Plant No. 2 consists of a primary clarifier, a trickling filter, a secondary clarifier and an anaerobic digester. Both of these plants are no longer in use. Plant No. 3 consists of an oxidation ditch, secondary clarifiers, disinfection facilities, and other support facilities.

The purpose of this study is to develop a facilities plan for treatment of the City's wastewater for the 20-year planning period from 2010 (start of operation) through 2030. The planned facilities must comply with the discharge requirements of the California Regional Water Quality Control Board-Central Valley Region (RWQCB).

1.2 BACKGROUND

The City is an incorporated city situated along the Kings River. It is located 25 miles southeast of Fresno and approximately 12 miles east of State Highway 99, in Fresno County. A location map is shown in Figure 1.1.

The facility consists of three separate WWTP located at the same site. Plant No. 1 consists of imhoff tanks, a rectangular standard rate trickling filter, settling and storage. This WWTP was abandoned in place in the 1970. Plant No. 2 is a trickling filter plant that consists of a primary clarifier, a high rate rock trickling filter, a secondary clarifier, and an anaerobic digester. This plant was taken off line in 1982. Plant No. 3 consists of an oxidation ditch, secondary clarifiers, disinfection and other support facilities. This facility provides the current treatment for the wastewater from the City.

The effluent is discharged to percolation ponds. The City also has the option to discharge chlorinated and de-chlorinated effluent to the Kings River. This disposal option has not been used since 1998. The biosolids produced at the facility are dewatered using centrifuges and trucked to McCarthy Farms for disposal.

1.3 PURPOSE AND SCOPE OF STUDY

The purpose of this study is to develop a facilities plan based on projected flows and loadings through the year 2030. Treatment, effluent disposal, and biosolids disposal alternatives are studied, and a recommended project including an implementation schedule developed.

The primary goal of the study is to develop a plan which will meet the anticipated discharge requirements of the RWQCB.

The study was authorized by the City Council at its regular meeting of February 8, 2005.

1.4 PREVIOUS STUDIES AND REPORTS

The list of studies and reports shown in Table 1.1 have been reviewed and incorporated into the preparation of this study.

Table 1.1 Previous Studies and Reports
Wastewater Treatment Plant Master Plan
City of Reedley

Name	Date
Clarifier Emergency Response Plan	March 2005
Demolition of Plant No. 1 - Technical Memorandum No. 1	March 2005
Addition of a New Clarifier - Technical Memorandum No. 2	March 2005
Work Plan for the Determination of Constituents of Concern (BPTC)	November 2003
Industrial Pretreatment Program	November 2003
Reasonable Potential Analysis WWTP Facility	June 2003
Work Plan for the Determination of BPTC (Non-Surface Water Discharge)	August 2002
Groundwater Assessment	August 2001
WDR's (Order No. 5-01-257) (NPDES No. CA0081230)	December 2001
Wastewater Reclamation Feasibility Study	April 1997
Preliminary Design Report	May 1994
Master Plan for Wastewater Treatment and Disposal Facilities	August 1993

1.5 GENERAL

1.5.1 Climate

The climate in Reedley is characterized as a "Mediterranean" type climate; the winters are cool and moist, and the summers are dry and warm. Approximately 85 percent of the precipitation occurs during November through April. Rainfall averages 12-inches per year. Fresno and Tulare Counties experiences foggy conditions during the winter. This type of fog is known as "radiation fog". These fogs are more severe and persist longer in the lower elevations of the San Joaquin Valley.

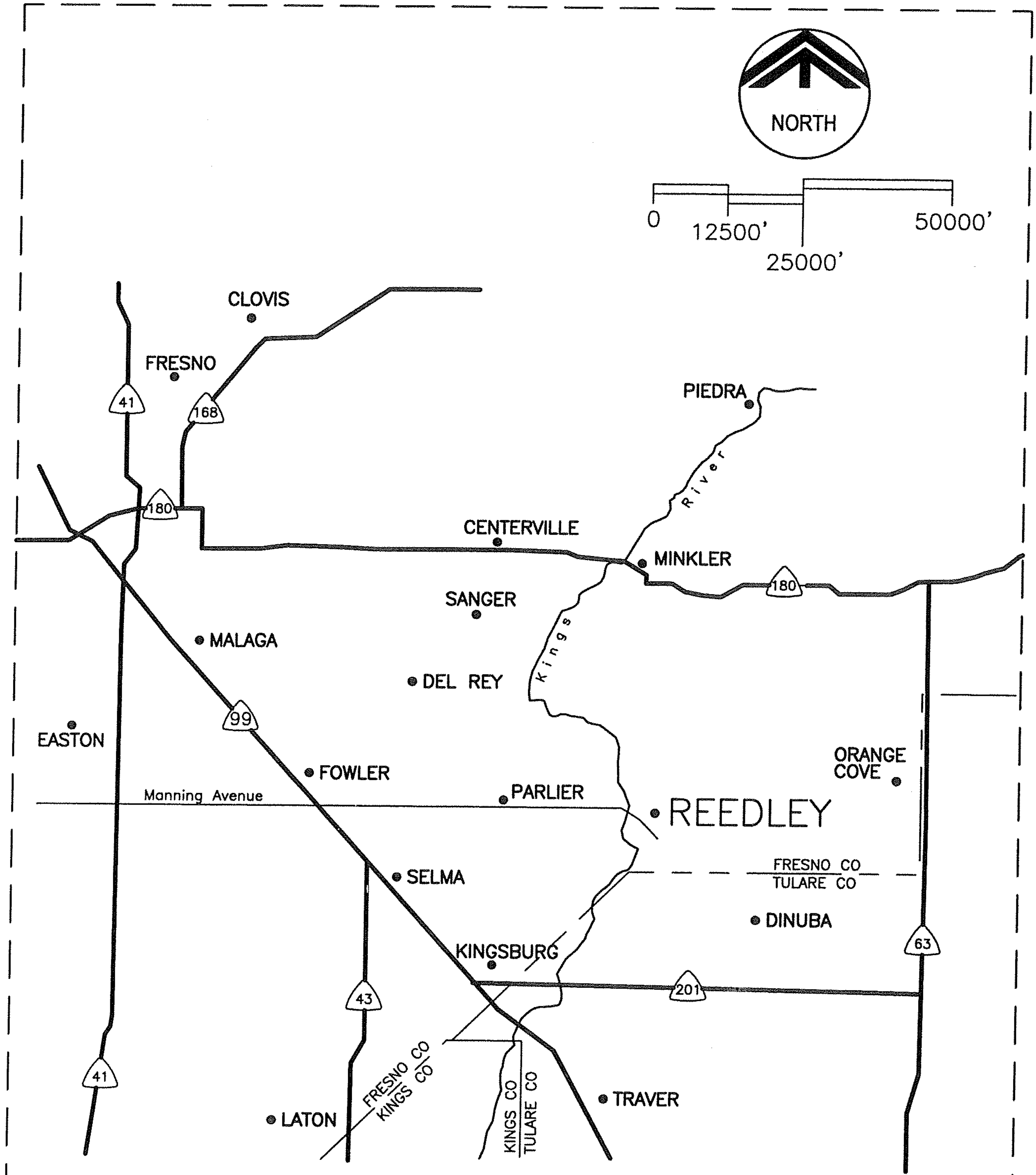

Figure 1.1
LOCATION MAP
WASTEWATER TREATMENT PLANT MASTER PLAN
CITY OF REEDLEY

1.5.2 Topography

The City is located in the central portion of the San Joaquin Valley. This area consists of large areas of alluvial fans, which are relatively flat and featureless. This it typical topography encountered throughout the San Joaquin Valley. The San Joaquin Valley floor in this area generally slopes from the northeast to the southwest. Specifically, at the WWTP site the drainage is to the south and east into the Kings River.

According to the Flood Insurance Rate Map (FIRM) prepared by the Federal Emergency Management Agency, the WWTP is predominantly located outside of the 100-year flood hazard zone. A narrow strip of land parallel to the Kings River lies within a zone identified as either between the 100- and 500-year flood hazard zone or levee protected from a 100-year flood. The City maintains a levee protecting the lower portion of the plant site parallel to the Kings River. The upper portion of the WWTP site, which contains the treatment units and administration buildings, lies above the 500-year flood plain.

1.5.3 Geology

The alluvial fan deposits in the Valley consist primarily of silts, fine sands, and clay layers. The clay layers are intermittently dispersed at various depths throughout the area. These layers separate the upper unconfined aquifer from several lower semi-confined water aquifers. The soil types in the vicinity of the WWTP include Hanford sandy loam, Tujunga loamy sand, and Grangeville soils according to the USDA Soils Conservation Service Soil Survey of Eastern Fresno Area, California, 1971.

The WWTP is located in a seismically active region. This, however, has not placed the site in an earthquake fault zone (special studies zone) and the potential for ground rupture due to faulting is low. The California Building Code places the WWTP in seismic Zone 3 for the design of facilities. The mild topography and low elevation tends to negate the threat of landslides and liquification.

1.5.4 Groundwater

Quarterly groundwater reports from 1999 through 2001 indicate that the groundwater beneath the WWTP site varies from 15 to over 30 feet below grade. This variation is due to surface relief rather than steep groundwater gradient. Groundwater flows generally southeast towards the Kings River; however, data from the early 1990's indicated a northwesterly flow away from the Kings River. Fluctuations are likely due to effluent mounding and seasonal effects from the various river stages.

1.5.5 Water Supply

The City water system consists of a series of wells that draw from deep aquifers. There are no wells located on the west side of the Kings River. There is a City subdivision, immediately north of the WWTP, that is served by the City system.

EXISTING AND PROJECTED SERVICE AREA

2.1 SUMMARY

The service area of the Reedley WWTP is essentially the incorporated limits of the City. The City is expected to grow during the current planning period at a growth rate of four percent. Recent growth has been at much lower rates due to moratorium to allow the City time to complete the Reedley Specific Plan. It is anticipated now that the moratorium has been lifted that here will be an increase in the growth rate of the City. By the year 2030, the projected population will be slightly over 60,000, from a current population of 22,623.

2.2 SERVICE AREA

The City is an agricultural community located on the east side of the San Joaquin Valley approximately 25 miles southeast of the City of Fresno. The Reedley WWTP is located approximately 1.5 miles southwest of the center of the City, on the west bank of the Kings River. The Kings River forms the east and south boundaries of the WWTP. Land on the west and north boundaries is primarily agricultural. However, new residential development is occurring in these areas. The location of the WWTP and its associated service area is shown in Figure 2.1.

2.3 HISTORICAL AND PROJECTED POPULATIONS

Population data and growth projection estimates are essential to determining the present per capita wastewater flows and to estimating future wastewater flow projections. To project population an average growth rate is used. Per the direction of the City's Planning Department, the growth rate for the facilities planning is four (4.0) percent. This is consistent with the current General Plan, which projects a growth rate of 3.25 percent to 4.0 percent through the year 2012.

Historical and projected populations using the four percent projection rate for the City are outlined in Table 2.1 and shown graphically in Figure 2.2. Based on the Planning Department's estimated four percent growth rate over the next 25 years, the design population for the year 2030 will be 60,310 residents.

From 1990 to 2004, the City has experienced varied growth rates, with an average of approximately 2.3 percent per year, as shown in Table 2.1. During this period, two years experienced growth rates over 4.5 percent. Also depicted in Table 2.1 is a period from 1999 through 2003 with lower than average growth rates. During this period the City adopted a moratorium on residential single and multiple family development. The moratorium was required to allow the City needed time to complete the Reedley Specific Plan and address planning concerns over set backs, street widths and similar issues in new developments.

With the moratorium now lifted it is anticipated that the development will occur at an increased pace over the next several years to make up for the years of low development when the moratorium was in effect.

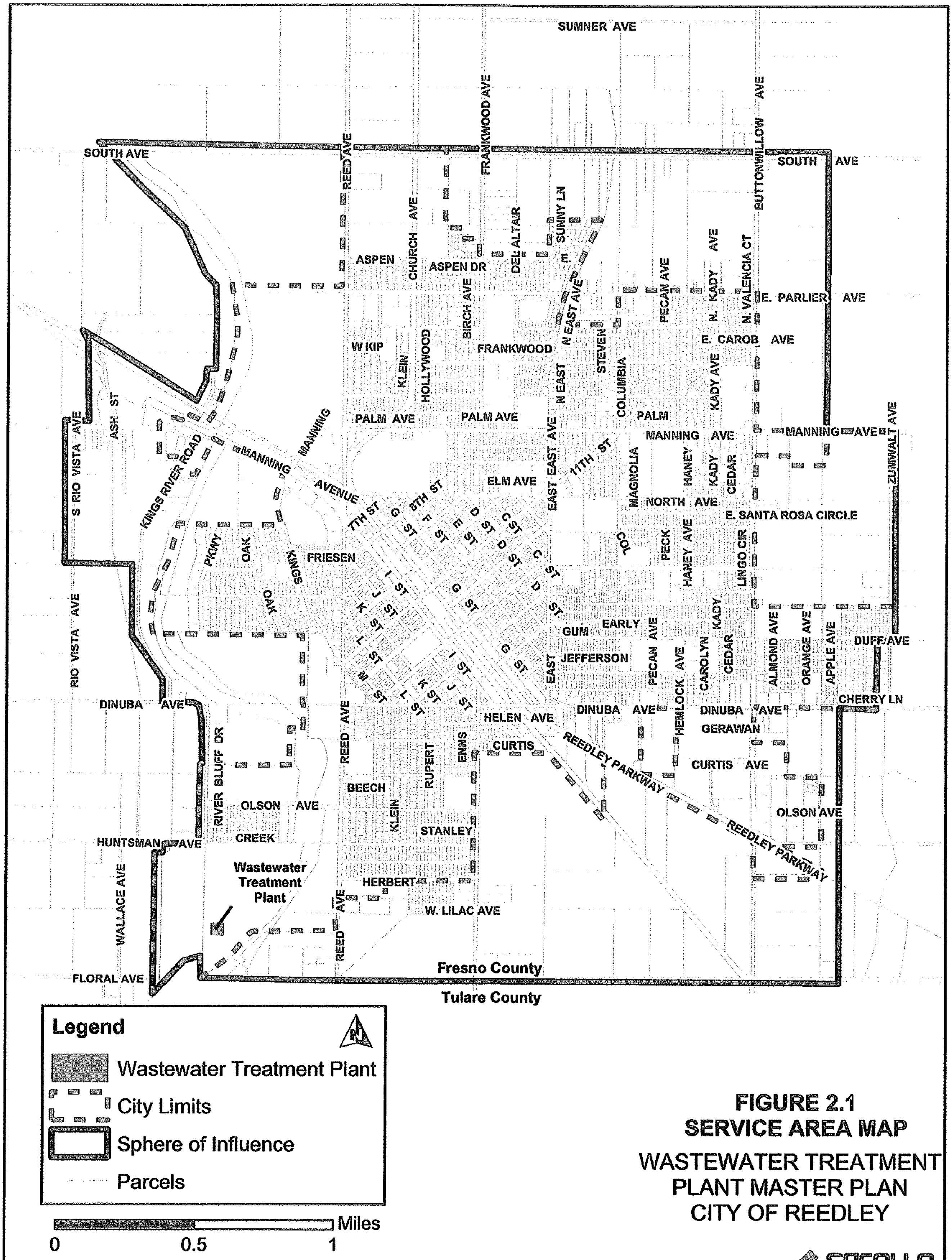

FIGURE 2.1
SERVICE AREA MAP

WASTEWATER TREATMENT PLANT MASTER PLAN
CITY OF REEDLEY

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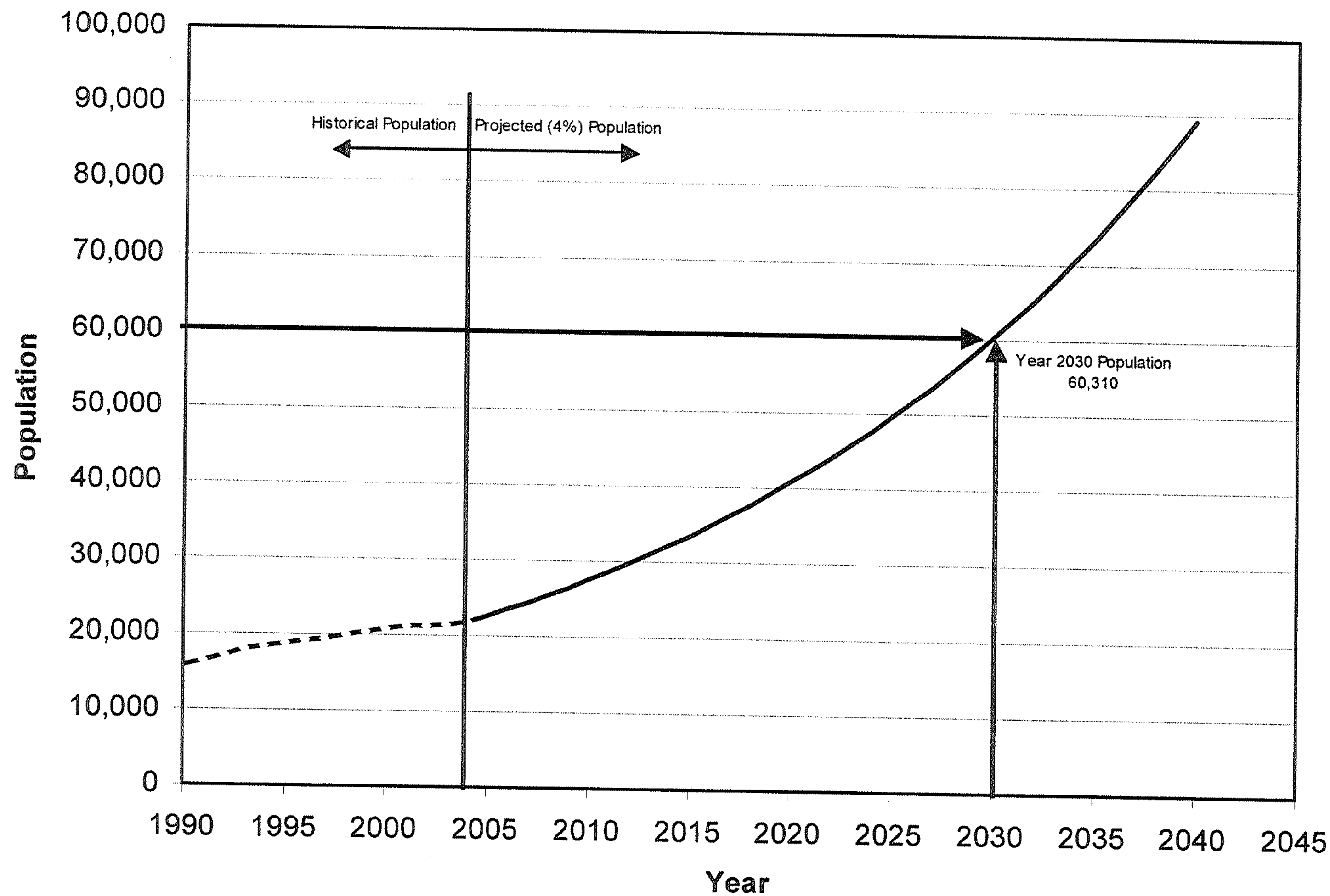

Figure 2.2
HISTORICAL AND PROJECTED POPULATION
WASTEWATER TREATMENT PLANT MASTER PLAN
CITY OF REEDLEY

Table 2.1 Historical and Projected Population Wastewater Treatment Plant Master Plan City of Reedley

Year	Population(1)	Percent Growth
1990	15,791	-
1991	16,312	3.3%
1992	17,198	5.4%
1993	18,048	4.9%
1994	18,387	1.9%
1995	18,721	1.8%
1996	19,102	2.0%
1997	19,499	2.1%
1998	20,062	2.9%
1999	20,428	1.8%
2000	20,756	1.6%
2001	21,144	1.9%
2002	21,218	0.4%
2003	21,439	1.0%
2004	21,753	1.5%
2005	22,623	4.0%
2006	23,528	4.0%
2007	24,469	4.0%
2008	25,448	4.0%
2009	26,466	4.0%
2010	27,524	4.0%
2015	33,488	4.0%
2020	40,743	4.0%
2025	49,570	4.0%
2030	60,310	4.0%

(1) Populations are projected at 4 percent for years 2005 and beyond.

HISTORICAL AND PROJECTED FLOWS AND LOADINGS

3.1 SUMMARY

An analysis of the plant's historical data was made to determine flow and loading factors for projecting future flows and loadings. The design of wastewater treatment plants is generally based on the maximum month average daily (MMAD) flows. Using this approach the WWTP will have the capacity to treat the wastewater from the maximum month conditions as well as the average month.

The historical maximum month average daily flow to annual average daily flow factor was found to be 1.14. This value is used for the projections herein. The peak hour to annual average daily flow factor was found to be 2.16 based upon a storm event on December 31, 2004. However, the plant flow meter could not record the actual maximum flow because it exceeded its range. Therefore, a factor of 2.5 is used in this report.

A value of 100 gallons per capita per day is used in this study. With the projected 2030 population of 60,310, the annual average daily flow is projected to be 6.03 million gallons per day (mgd). The maximum month average daily flow is projected to be 6.88 and the peak hour flow is projected to be 15.08 mgd.

Historical influent BOD_5 loading was found to average 157 mg/L. Peak month loading was found to be 177 mg/L or 1.13 times greater. The projected BOD_5 loadings are estimated to be 10,900 pounds per day for the peak month. Historical influent TSS loading was found to average 186 mg/L. Peak month loading was found to be 216 mg/L or 1.16 times greater. The projected TSS loadings are estimated to be 12,600 pounds per day for the peak month. The 2030 nitrogen load is projected to be 1,435 pounds per day.

A review of the plant's biosolids production was made. The average projection rate was found to be 1159 pounds per 1 mgd.

3.2 HISTORICAL INFLUENT FLOWS

3.2.1 Annual Average Daily Flows

The relationship between historical population and annual average daily (AAD) flow is used to determine the wastewater flows per capita in gallons per capita per day (gpcd). The historical gpcd is then used to estimate the projected flow for the planning period. The flows used to determine the gpcd include all of the flows into the WWTP. Historical AAD flows for the last ten years are outlined in Table 3.1 below, and shown graphically in Figure 3.1.

Table 3.1 Historical Annual Average Daily (AAD) Flow
Wastewater Treatment Plant Master Plan
City of Reedley

Year	Population	Flow (mgd)	Per Capita Flow (gpcd)
1995	18,721	1.673	89
1996	19,102	1.867	98
1997	19,499	2.119	109
1998	20,062	2.248	112
1999	20,428	2.334	114
2000	20,756	2.453	118
2001	21,144	2.382	113
2002	21,218	2.389	113
2003	21,439	2.395	112
2004	21,753	2.317	107
10-Year Average			109

The calculated average value for the per capita wastewater flow for the past 10 years is 109. This value is expected to decrease with future development. This decrease is due to several factors including but not limited to those outlined below:

- New sewers are being constructed with longer pipe, often 10 feet or longer in length. This results in fewer pipe joints which minimizes infiltration.
- New sewer pipe joints incorporate better gaskets which reduce infiltration.
- Modern manhole construction results in fewer joints and better sealants which result in less inflow and infiltration.
- Modern plumbing fixtures use less water.
- Industries are becoming more water conservative.

Therefore, for the purpose of this report, a per capita flow rate of 100 gpcd is used for projecting future AAD flows. Using a value of 100 gpcd may slightly underestimate the wastewater flows in the short term, is appropriate for estimating the AAD flows for the planning period. In addition, 100 gpcd is consistent with per capita flows used by other cities and communities in the Central Valley.

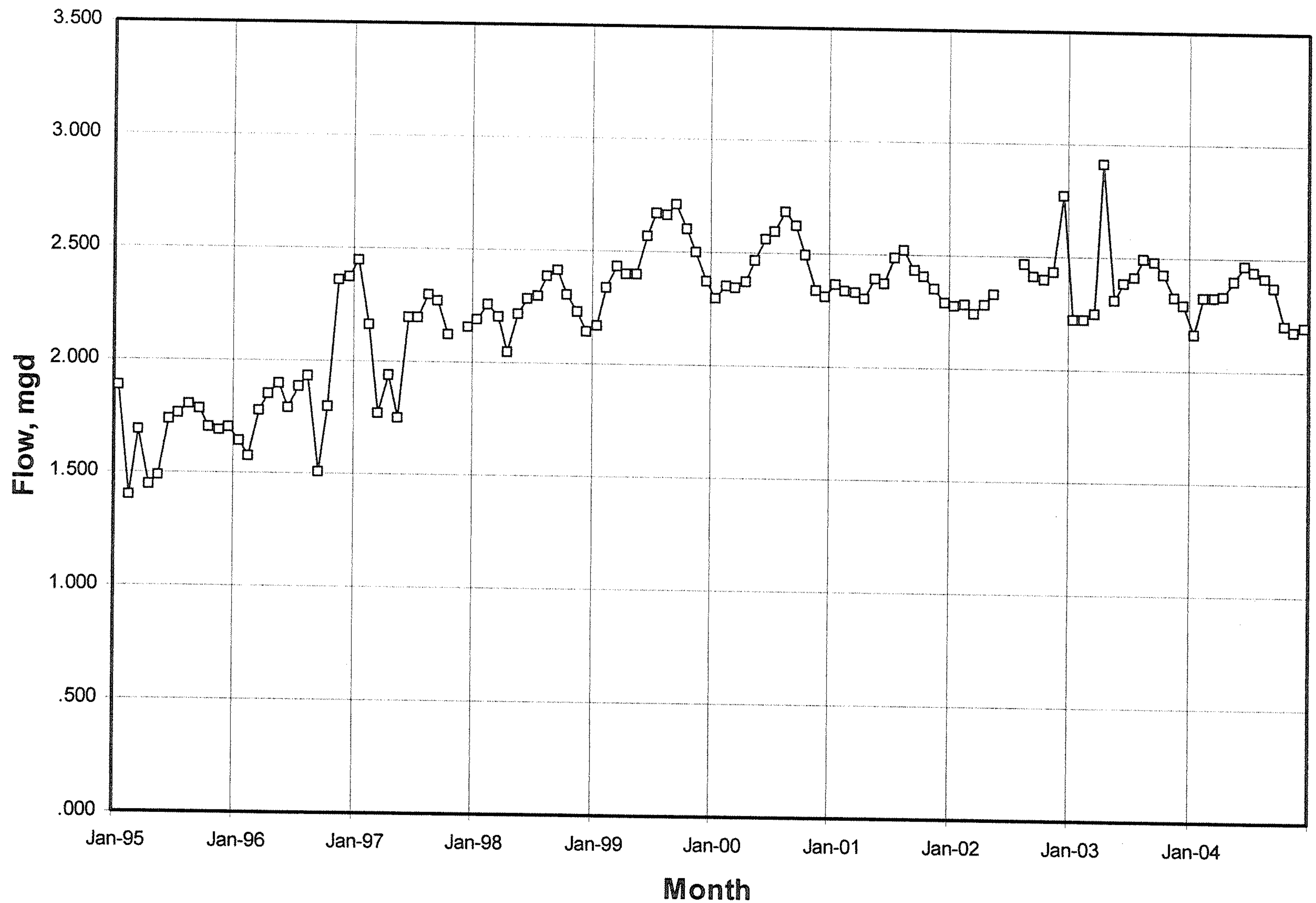

Figure 3.1
HISTORICAL MONTHLY AVERAGE DAILY FLOW
WASTEWATER TREATMENT PLANT MASTER PLAN
CITY OF REEDLEY

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3.2.2 Maximum Month Average Day Flow

The design of wastewater treatment plants is generally based on the maximum month average daily (MMAD) flows. Using this approach, the WWTP will have the capacity to treat the wastewater from the maximum month conditions as well as the average month. To project the MMAD flows the ratio of the historical MMAD to the AAD flows of the previous 10 years was determined. As shown in Table 3.2 below the average MMAD to AAD ratio for the most recent 10-year period is 1.14. This MMAD to AAD factor is used to determine the MMAD flows for the future planning period.

Table 3.2 Historical AAD and MMAD Flows
Wastewater Treatment Plant Master Plan
City of Reedley

Year	AAD Flow (mgd)	MMAD Flow (mgd)	MMAD:AAD Factor
1995	1.673	1.883	1.13
1996	1.867	2.375	1.27
1997	2.119	2.447	1.15
1998	2.248	2.410	1.07
1999	2.334	2.711	1.16
2000	2.453	2.685	1.10
2001	2.382	2.520	1.06
2002	2.389	2.773	1.16
2003	2.395	2.914	1.22
2004	2.317	2.468	1.07
10-Year Average			**1.14**

3.2.3 Peak Hourly Flow

The peak hourly (PH) flow is required to make certain the pipelines, meters, and other critical hydraulic appurtenances are sized adequately, and to minimize any potential for flooding or overflow during high flow events. Peak hourly flows usually occur in wet weather because of infiltration and inflow. To determine this peaking factor, the peak instantaneous influent flows recorded are compared to the average daily flows. For this analysis the peak rainfall recorded in Reedley in 2004 was on December 31, 2004. On this day, approximately 1.46 inches of rainfall was recorded in the City. This also represented the largest daily influent flow to the WWTP. A review of the influent flow meter strip charts revealed that the peak flow to the WWTP on this day exceeded the maximum flow reading range of the strip chart which was 5.0 mgd. Based on this flow, the ratio of the PH flow to AAD flow was at least 2.16. Since the peak flow actually exceeded the strip chart recording capacity a PH flow factor of 2.5 times the AAD is assumed. This factor is similar to flow projection factors used at similar sized communities in the regional area. The flow projection factors and their corresponding flows used in this analysis are presented in Table 3.3 below.

Table 3.3 Flow Projection Factors
Wastewater Treatment Plant Master Plan
City of Reedley

Flow Condition	Flow Projection Factor
Average Wastewater Flow per Person per Day (gpcd)	100
Average Annual Daily Flow (AAD)	1.0
Maximum Month Average Day Flow (MMAD)	1.14
Peak Hourly Flow (PH)	2.5

3.3 PROJECTED INFLUENT FLOWS

Applying the above flow projection factors to the estimated future population at a 4.0 percent growth rate, results in the projected yearly flows shown in Table 3.4 below. The Reedley WWTP should have the capacity to handle the MMAD flows through the year 2009.

3.4 HISTORICAL INFLUENT LOADINGS

3.4.1 General

Generally, wastewater strength is defined by its 5-day biochemical oxygen demand (BOD_5), total suspended solids (TSS), and its nitrogen content. The BOD_5 is described as the amount of oxygen required over a five-day period at 20 degrees Celsius by bacteria while stabilizing the decomposable organic matter under aerobic conditions. The TSS is a measure of the suspended material in the influent. Nitrogen can be found in many different forms such as ammonia (NH_3), organic nitrogen (N), nitrate (NO_3) and others. Typically, the nitrogen in untreated domestic wastewater is comprised of ammonia plus organic nitrogen and is defined as total Kjeldahl nitrogen (TKN).

3.4.2 Influent BOD_5

Historical influent BOD_5 loadings for the past 5 years are shown graphically in Figure 3.2 and Table 3.5. The five-year historical BOD_5 concentration for this time period was 157 mg/L for the annual average loads, and 177 mg/L for maximum monthly average loads. Table 3.5 also demonstrates the consistency in the MMAD:AAD factor for the same time period.

Table 3.4 Flow Projection Factors
Wastewater Treatment Plant Master Plan
City of Reedley

Year	Population[(1)]	AAD Flow (mgd)	MMAD Flow (mgd)	PH Flow (mgd)
2004[(2)]	21753	2.317	2.468	>5.0
2005[(2)]	22,623	2.32	2.58	5.65
2006	23,528	2.35	2.68	5.88
2007	24,469	2.45	2.79	6.13
2008	25,448	2.55	2.91	6.38
2009	26,466	2.67	3.04	6.68
2010	27,524	2.75	3.14	6.88
2015	33,488	3.35	3.82	8.38
2020	40,743	4.07	4.64	10.18
2025	49,570	4.96	5.65	12.40
2030	60,310	6.03	6.88	15.08

Notes:
(1) Assumes a 4.0% yearly growth rate for years 2005 and beyond.
(2) Historical values

Table 3.5 Historical Influent BOD_5 Loading
Wastewater Treatment Plant Master Plan
City of Reedley

Year	Annual Average mg/L	Annual Average ppd	Maximum Month mg/L	Maximum Month ppd	MMAD:AAD Factor
2000	139	2849	164	3476	1.18
2001	159	3166	179	3579	1.12
2002	162	3217	189	3836	1.17
2003	163	3254	182	3772	1.12
2004	160	3160	169	3380	1.05
5-year average	**157**		**177**		**1.13**

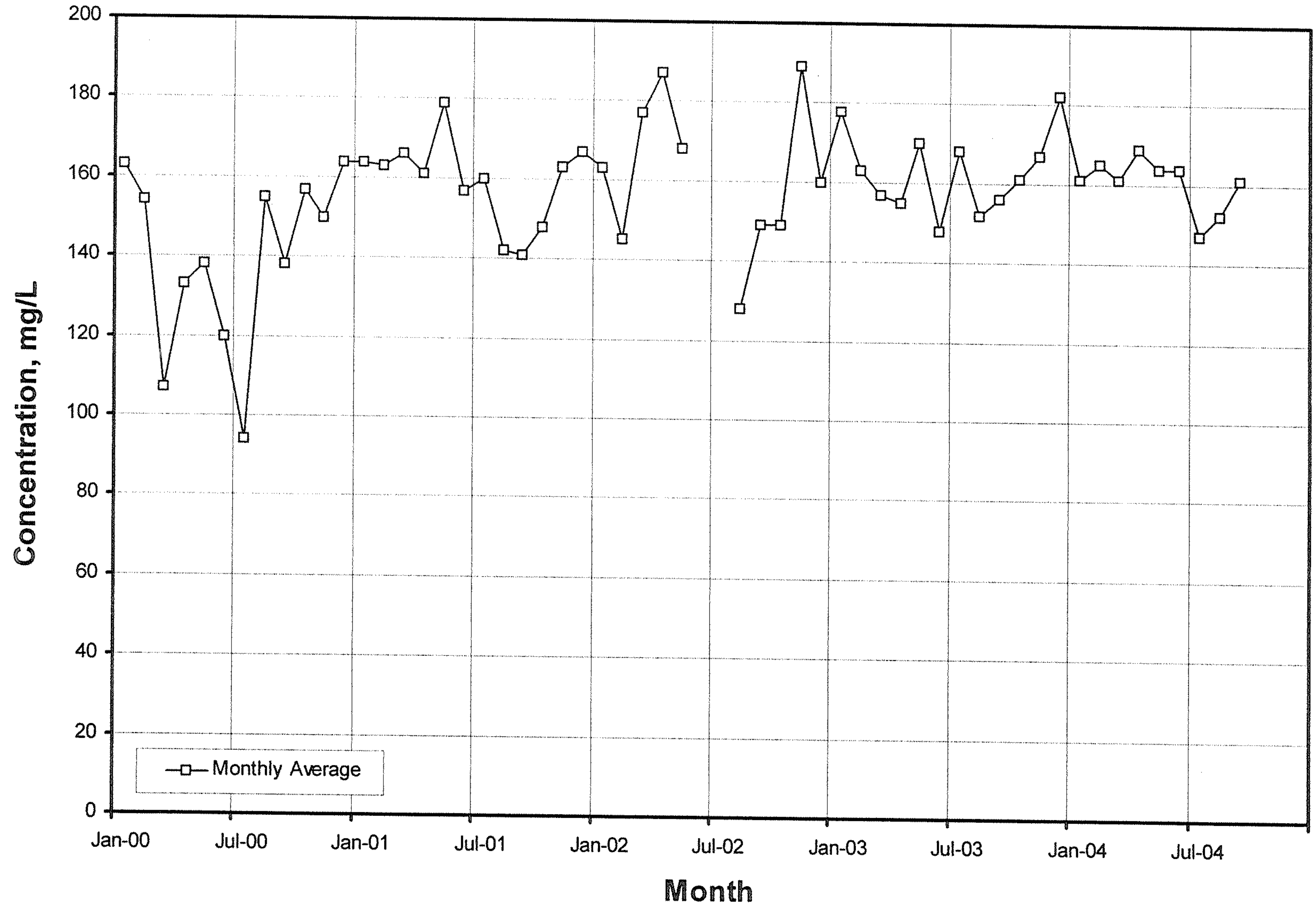

Figure 3.2
HISTORICAL MONTHLY AVERAGE OF INFLUENT BOD_5 CONCENTRATIONS
WASTEWATER TREATMENT PLANT MASTER PLAN
CITY OF REEDLEY

Based on a review of the above data, a MMAD BOD_5 concentration of 190 mg/L is assumed to determine future design loadings. This value reflects the highest MMAD BOD_5 concentration over the five-year period and is consistent with the 1993 Master Plan and other communities of similar size in the Central Valley.

3.4.3 Influent TSS

Historical influent TSS loadings for the past 5 years are shown in Table 3.6 below and graphically in Figure 3.3. The annual average TSS concentration is determined to be 186 mg/L, and the maximum monthly average for TSS is 216 mg/L. As with BOD_5, the MMAD:AAD factor for TSS concentrations has also remained steady throughout the last five year period.

Table 3.6 Historical Influent TSS Loadings
Wastewater Treatment Plant Master Plan
City of Reedley

	Annual Average		Maximum Month		MMAD:AAD
Year	**mg/L**	**ppd**	**mg/L**	**ppd**	**Factor**
2000	188	3840	213	4620	1.13
2001	196	3909	220	4346	1.12
2002	176	3511	215	4123	1.22
2003	181	3614	219	4066	1.21
2004	189	3719	211	4016	1.12
5-year average	**186**		**216**		**1.16**

Based on this analysis a MMAD TSS concentration of 220 mg/L is assumed to determine future design loadings. This value reflects the highest MMAD BOD_5 concentration over the five-year period and is consistent with the 1993 Master Plan and other communities of similar size in the Central Valley.

3.5 HISTORICAL PLANT PERFORMANCE

The records for the effluent quality from the WWTP for the last five years were also reviewed and tabulated. Generally, the WWTP has produced an excellent quality effluent. Data for the effluent BOD_5 and TSS are presented below.

3.5.1 Effluent BOD_5

The effluent BOD_5 shown in both concentration (mg/L) and loading (ppd) are shown in Table 3.7 below. Based on this data, over the last 5 years the plant effluent BOD_5 has averaged 3 mg/L. The corresponding BOD_5 removal rates, determined from comparing the

Table 3.7	Historical Effluent BOD_5 Wastewater Treatment Plant Master Plant City of Reedley		
	Annual Average		
Year	**mg/L**	**lbs/day**	**Removal (%)**
2000	3	54	98.1
2001	3	56	98.2
2002	3	46	98.2
2003	4	73	97.8
2004	3	64	98.0
5-year average	**3**		**98.1**

annual average influent and effluent concentration values, are also shown with a 5-year average BOD_5 removal rate of 98.1 percent.

3.5.2 Effluent TSS

Likewise, the effluent TSS, in both concentration (mg/L) and loading (ppd), is shown in Table 3.8 below. Based on this data, over the last 5 years the plant effluent TSS has averaged 5.4 mg/L. The corresponding TSS removal rate, based on a comparison of the annual average influent and effluent TSS concentration values, has a 5-year average of 97.1 percent.

Table 3.8	Historical Effluent TSS Wastewater Treatment Plant Master Plan City of Reedley		
Year	**Annual Average**		**Removal (%)**
2000	5	107	97.2
2001	5	95	97.6
2002	4	69	97.8
2003	8	150	95.8
2004	5	107	97.1
5-year average	**5.4**		**97.1**

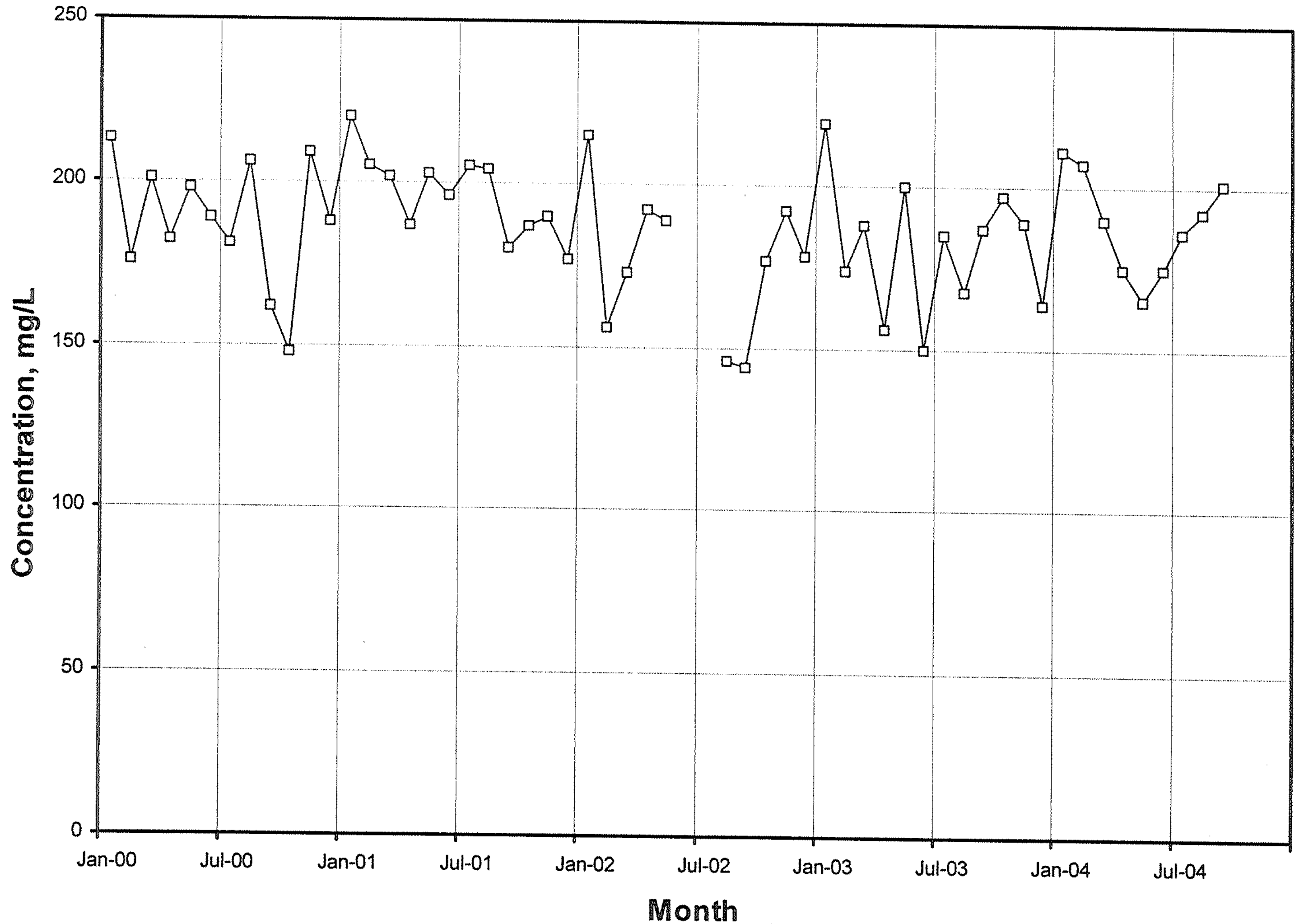

Figure 3.3
HISTORICAL MONTHLY AVERAGE
INFLUENT TSS
WASTEWATER TREATMENT PLANT MASTER PLAN
CITY OF REEDLEY

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3.6 PROJECTED INFLUENT LOADINGS

Generally, the design loading for a WWTP facility is determined by the MMAD flows and MMAD loadings previously identified. These projected values are used to determine the organic loading for the planning period.

3.6.1 BOD_5

The projected BOD_5 loadings presented in Table 3.9 are determined using the previously identified MMAD BOD_5 concentration of 190 mg/L. The BOD_5 loading at the end of the planning period is approximately 11,000 ppd.

Table 3.9 Projected Influent BOD_5 Loadings
Wastewater Treatment Plant Master Plan
City of Reedley

Year	Projected MMAD Flow (mgd)	Projected MMAD Loading (ppd)
2005	2.58	4,088
2006	2.68	4,247
2007	2.79	4,421
2008	2.91	4,611
2009	3.04	4,817
2010	3.14	4,976
2015	3.82	6,053
2020	4.64	7,353
2025	5.65	8,953
2030	6.88	10,902

3.6.2 TSS

Utilizing MMAD influent flows and the MMAD TSS concentration of 220 mg/L, future TSS loads are presented in Table 3.10. As shown the design TSS concentration for the year 2030 is over 12,600 ppd.

3.6.3 Nitrogen

The City has not historically collected nitrogen samples on the WWTP influent. However, based on data from other communities of similar size in the central valley, an influent TKN design value of 25 mg/L is assumed. This results in a 2030 TKN influent loading of 1,435 ppd.

Table 3.10 Projected Influent TSS Loadings Wastewater Treatment Plant Master Plan City of Reedley		
Year	Projected MMAD Flow (mgd)	Projected TSS Loading (ppd)
2005	2.58	4,734
2006	2.68	4,917
2007	2.79	5,119
2008	2.91	5,339
2009	3.04	5,577
2010	3.14	5,761
2015	3.82	7,009
2020	4.64	8,513
2025	5.65	10,367
2030	6.88	12,623

3.6.4 Summary of Projected Influent Flows and Loadings

The following table outlines the recommended year 2030 influent design flows used in the alternative evaluations included as part of this Master Plan.

Table 3.11 Summary of Design Influent Flows and Loadings - Year 2030 Wastewater Treatment Plant Master Plan City of Reedley	
Parameter	Value
AAD Flow	6.03
MMAD Flow	6.88
PH Flow	15.08
MMAD BOD_5 Concentration	190 mg/L
MMAD BOD_5 Loading	10,902 ppd
MMAD TSS Concentration	220 mg/L
MMAD TSS Loading	12,623 ppd
TKN Concentration	25 mg/L
TKN Loading	1,435 ppd

It is recommended that these design flows and loadings be confirmed and further refined during the design period.

3.7 HISTORICAL AND PROJECTED BIOSOLIDS PRODUCTION

The biosolids production for the years 2003 and 2004 is outlined in Table 3.12 below. As shown in the table, the City produced approximately 1159 dry pounds of biosolids per million gallons (MG) of wastewater treated. This is a typical value for biosolids production from an extended aeration facility. A biosolids production rate of 1200 dry pounds of biosolids per MG of wastewater treated at AAD flows, is assumed for future biosolids design loadings.

Table 3.12 Historical Biosolids Production
Wastewater Treatment Plant Master Plan
City of Reedley

Year	AAD Flow (mgd)	Biosolids (dry tons/yr)	Biosolids (lbs/mgd)
2003	2.395	501.33	1147
2004	2.317	495.00	1170
Average			**1159**

EXISTING AND FUTURE REGULATORY REQUIREMENTS

4.1 SUMMARY

The Reedley WWTP currently operates under Waste Discharge Requirements (WDRs) issued by the Regional Water Quality Control Board (RWQCB). Reedley's WDR contains numeric and narrative limits for the WWTP effluent, the Kings River, and the groundwater beneath the WWTP boundary.

In terms of effluent requirements, discharge to the percolation ponds requires less stringent effluent limits compared to what is required to discharge to the Kings River. In terms of receiving waters, there are numeric limits for both the Kings River and the groundwater to protect beneficial uses. The RWQCB has indicated to the City that a total nitrogen limit on the effluent is likely to be established in the City's future WDR, to protect the underlying groundwater. It is expected the limit will be 10 mg/L for total nitrogen.

Discharge to the Kings River requires continuation of the NPDES permit, which is a federal permit. The WWTP has not discharged to the River since 1998, and percolation pond capacity is adequate for current and future flows. Therefore, it is recommended the WWTP discontinue the option to discharge to the Kings River, thereby eliminating the NPDES permit from the City's WDR. The discharge option is simply not needed, and it is economically advantageous to eliminate the NPDES permit.

Reedley's effluent meets undisinfected secondary criteria based upon California Code of Regulations Title 22. The effluent can be used to irrigate fodder, fiber, and seed crops. In order to irrigate vineyards, orchards, landscaping, or golf courses, the effluent must be treated to disinfected tertiary levels.

Currently, the Reedley WWTP disposes of biosolids by having a permitted land applier, McCarthy Farms, load, haul, compost and spread the biosolids on agricultural land in Kings County. The biosolids must be composted because the WWTP process does not treat the biosolids to the "Class A" level of pathogen destruction that is required for direct land application in Kings County. Fresno, Kings, Kern and Riverside Counties have passed ordinances banning land application of biosolids that have not been treated to Class A standards. It does not appear to be cost effective for Reedley to produce Class A biosolids on-site, prior to off-site land application.

The San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) issues the emissions permit for the WWTP. Prohibitory Rules applicable to major treatment plant operations include emission limits for conventional pollutants (NOx, SOx, CO, VOCs), nonconventional pollutant (i.e. metals), visible emissions, odors (nuisance), fugitive dust emissions, and particulates. At the Reedley WWTP, the source of conventional air contaminants is predominantly derived from the operation of the standby generator, which is fueled by diesel fuel. The standby generator is only used occasionally. Other sources of contaminants are derived from fugitive emissions from the wastewater processes.

4.2 BACKGROUND

Wastewater discharges are governed by both federal and state requirements. The primary laws regulating water quality are the Clean Water Act (CWA) and the California Water Code. Under the CWA, the Environmental Protection Agency (EPA) or a delegated State agency regulates the discharge of pollutants into waterways through the issuance of National Pollutant Discharge Elimination System (NPDES) permits. NPDES permits set limits on the amount of pollutants that can be discharged into the surface waters of the United States.

The California Water Code and the Porter-Cologne Act, a provision of the Code, require the State to adopt water quality policies, plans and objectives for the protection of the State's waters. The State Water Resources Control Board (SWRCB) and the nine RWQCBs meet this requirement by establishing water quality criteria in regional Basin Plans, the Inland Surface Waters, Enclosed Bays and Estuaries Plan, the Thermal Plan, and the Ocean Plan.

The RWQCB is responsible for developing and issuing WDRs to treatment facilities that discharge to land (for percolation and/or irrigation), and NPDES permits for treatment facilities that discharge to surface waters of the United States. The RWQCB is also responsible for issuing recycled water permits, as well as approving biosolids applications for dischargers within the State of California. Both the SWRCB and RWQCBs have regulatory authority along with the Department of Health Services (DHS) over projects using recycled water. The interagency involvement between the SWRCB, RWQCB and DHS is discussed within this chapter.

4.2.1 Agencies Responsible for Reedley's Regulations

The RWQCB Central Valley Region is responsible for developing and issuing WDRs for the City of Reedley. They are also responsible for requiring the City to develop and implement a pretreatment program for industrial discharges to the WWTP, according to the EPA National Pretreatment Program regulations. The City of Reedley is responsible for obtaining all air quality permits from the San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD), which limits air emissions on various types of equipment within the WWTP.

4.3 WASTE DISCHARGE REQUIREMENTS (WDRs)

The Reedley WWTP is currently operating under NPDES permit No. CA0081230, issued by the RWQCB as WDR Order No. 5-01-257. A copy of the WDR is provided in Appendix A. The purpose of the WDR and NPDES permits are to set limits on pollutants in discharges of waste to receiving waters. The limits are designed to protect public health, present and future beneficial uses of receiving waters, and to preserve water quality objectives developed on a regional basis. The Order protects the quality of water and beneficial uses for both surface and groundwater.

Two separate effluent discharges are permitted within the WDR. The first discharge location (001) is to 39 acres of percolation ponds for final disposal by evaporation and percolation. The second discharge location (002) is to the Kings River. Discharges to the river are prohibited if the ratio of Kings River water to wastewater is less than 100:1. Discharge to the river is rare, and subject to favorable dilution conditions. The most recent discharge to the river was from April 13 to July 12, 1998, at which time the minimum dilution was about 1,500:1.

4.3.1 Effluent Flow Limitations

The permitted capacity of the WWTP is 3.5 mgd; however, the inoperable trickling filter plant reduces the design capacity of the WWTP to 3.0 mgd. The entire flow volume can be discharged to the pond system. The WDR does contain a smaller discharge limit on flows to the Kings River. This monthly average discharge must not exceed 1.75 mgd.

4.3.2 Effluent Electrical Conductivity (EC) Limits

For either discharge, the monthly average EC shall not exceed the average EC of the City's source water plus 500 μmhos/cm, or a total of 1000 μmhos/cm, whichever is less. The EC of the source water must be determined as a flow-weighted average. The average is typically around 360 μmhos/cm, which results in an effluent limit of 860 μmhos/cm. The limit does vary slightly from year to year. See also Section 4.3.6 and Table 4.4 for groundwater limits for EC and TDS (1,000 μmhos/cm and 600 mg/L, respectively).

4.3.3 Effluent Discharge Limits for Pond Discharge

The WWTP's effluent discharge requirements for discharge to the pond system are summarized in Table 4.1. In addition to the requirements in the table, several other stipulations apply:

- The arithmetic mean of BOD_5 and TSS collected over a monthly period shall not exceed 20 percent of the arithmetic mean of the influent samples (80 percent removal).

Table 4.1 Effluent Discharge Limits for Discharge to Ponds Wastewater Treatment Plant Master Plan City of Reedley			
Constituents	Units	Monthly Average	Daily Maximum
5-day Biochemical Oxygen Demand (BOD_5)	mg/L	40	80
Total Suspended Solids (TSS)	mg/L	40	80
Settleable Solids	ml/L	0.2	0.5

- The discharge shall not have a pH less than 6.5 or greater than 9.5.
- The dissolved oxygen content of the wastewater in the upper zone (one foot) of wastewater in all ponds shall not be less than 1.0 mg/L.
- Freeboard must not be less than two feet in any pond.

4.3.4 Effluent Discharge Limits for Kings River Discharge

The effluent discharge requirements for discharges to the Kings River are more stringent than those for the pond discharge. The requirements are listed in Table 4.2. In addition to the requirements in the table, several other stipulations apply:

- The arithmetic mean of BOD_5 and TSS collected over a monthly period shall not exceed 15 percent of the arithmetic mean of the influent samples (85 percent removal, or a maximum of 30 mg/L, whichever is less.
- The discharge shall not have a pH less than 6.0 or greater than 9.0.
- Survival of aquatic organisms in 96-hour bioassays of undiluted waste shall be no less than:
  - Minimum for any one bioassay = 70 percent
  - Median for any three or more consecutive bioassays = 90 percent

As noted in Table 4.2, effluent discharged to the river must be disinfected, whereas discharge to the percolation ponds (Table 4.1) does not require disinfection.

4.3.5 Receiving Water (Kings River) Limitations

During times that the WWTP discharges effluent to the Kings River, the discharge shall not cause the river to contain increased concentrations as listed in Table 4.3. In addition, the WDR states that the discharge shall not cause nuisances, exceed MCLs, or adversely affect beneficial uses of the river:

- Oils, greases, waxes, or other materials
- Pesticides or combinations of pesticides

- Discoloration
- Biostimulatory substances
- Radionuclides
- Toxic pollutants in the water column, sediments, or biota

The WDR also states that discharges to the river shall not cause a violation of any applicable water quality standard for receiving waters adopted by the RWQCB or SWRCB, pursuant to the CWA and any regulations adopted thereunder.

As stated at the beginning of this section, discharges to the Kings River are prohibited unless there is a minimum 100:1 dilution ratio provided by the river flow. During the last river discharge in 1998, the dilution ratio was 1,500:1. Because of the sizeable dilution required (and in fact observed), the current water quality limits listed in Table 4.3 to protect the Kings River are not an issue for the WWTP and would not likely be exceeded if another discharge were to occur. Discussion of the Reasonable Potential Analysis (RPA) for future possible water quality limits is discussed in Section 4.6.

Table 4.2 Effluent Discharge Limits for Discharge to Kings River
Wastewater Treatment Plant Master Plan
City of Reedley

Constituents	Units	Monthly Average	Weekly Average	7-Day Median	Daily Maximum
5-day Biochemical Oxygen Demand (BOD_5)	mg/L	10	15	--	30
	lbs/day	146[1]	219[1]	--	438[1]
Total Suspended Solids (TSS)	mg/L	10	15	--	30
	lbs/day	146[1]	219[1]	--	438[1]
Settleable Solids	ml/L	0.1	--	--	0.2
Chlorine Residual	mg/L	--	--	--	0.1
	lbs/day	--	--	--	1.5[1]
Total Coliform	MPN[2]/ 100 mL	--	--	23	240
Total Trihalomethanes	g/L	--	--	--	100

Notes:
1. Value based upon a maximum discharge of 1.75 mgd.
2. Most Probable Number.

Table 4.3	Receiving Water (Kings River) Limitations at River Station R-2[1] Wastewater Treatment Plant Master Plan City of Reedley
Constituents	**Limit**
Dissolved Oxygen	7.0 mg/L
Electrical Conductivity	200 μmhos/lm
Chlorine	0.01 mg/L
Normal Ambient pH	6.5 - 8.3
Changes in pH	0.3
Increase in Turbidity	
when background is between 0-5 NTU	1.0 NTU
when background is between 5-50 NTU	20%
when background is between 50-100 NTU	10 NTU
when background is greater than 100 NTU	10%
Temperature	5 F
Fecal Coliform (30 day average)	200 MPN/100ML[2]

Notes:

1. Location of Sample Station R-2 shall not exceed a distance of 300 feet downstream from the point of discharge to Kings River unless the prescribed distance is inaccessible.
2. or limited to 10% of total sample exceeding 400 MPN/100ml.

4.3.6 Groundwater Limitations

The discharge of wastes from any storage, treatment, or disposal component associated with the WWTP shall not, in combination with other sources of waste constituents, cause the groundwater under and beyond the WWTP and discharge area(s) to exceed the concentrations listed in Table 4.4. As noted in the footnote under Table 4.4, the constituent concentrations shall not exceed the limits specified therein, or natural background concentration, whichever is greater.

- In addition to the constituents listed in Table 4.4, WDR Provision G states that wastewater discharge must not cause the groundwater to exceed the following:
- Total coliform organisms of 2.2 MPN/100 mL.
- Total nitrogen in excess of 10 mg/L.
- The maximum contaminant levels (MCLs) for any of California's Title 22 drinking water standards.

- Taste and odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses, including but not limited to, ammonia (as N) in excess of 0.5 mg/L or natural background, whichever is greater.
- Constituent concentrations identified as follows or natural background concentrations, whichever is greater: toxic substances in concentrations that produce detrimental physiological responses in human, plant, or animal life; or chemical constituents and pesticides in concentrations that adversely affect beneficial uses.

4.3.7 Water Recycling Specifications

The WDR allows effluent recycling on the City-owned land at the WWTP. As such, recycling could be accomplished without the need for a separate water recycling permit. There is an orchard planted on the City property (approximately 20 acres), therefore it is unlikely recycling would occur on the property. This is because the current effluent quality does not the meet the DHS Food and Drug Branch criteria of disinfected tertiary for irrigating orchards (See Section 4.7).

4.3.8 Summary of WDR Limitations

As noted in the preceding paragraphs, Reedley's WDR contains numeric and narrative limits for the WWTP effluent, the Kings River, and the groundwater beneath and beyond the WWTP boundary.

Table 4.4 Groundwater Limitations
Wastewater Treatment Plant Master Plan
City of Reedley

Constituent	Units	Limitation[1]
Boron	mg/L	0.7
Chloride	mg/L	175
EC	umhos/cm	1,000
Sodium	mg/L	115
Total Coliform Organisms	MPG/100 mL	2.2
Total Dissolved Solids	mg/L	600
Total Nitrogen	mg/L	10
Ammonia (as NH_4)	mg/L	0.5

1. Concentration listed or natural background, whichever is greater.

In terms of effluent requirements, discharge to the percolation ponds requires less stringent effluent limits compared to what is required to discharge to the Kings River. In order to accommodate both disposal options however, the WWTP must be capable of meeting the more stringent river discharge requirements (Table 4.2). This includes disinfection facilities that are required to be used only for the river discharge option.

In terms of receiving waters, there are numeric limits for both the Kings River and the groundwater to protect their beneficial uses. The groundwater limits focus more on salinity constituents to protect agricultural uses. Both sets of limitations include similar narrative criteria to protect the water supplies from exceeding any applicable water quality criteria. The narrative criteria thus are intended to provide wide-reaching protection of the water supplies for any constituents not specifically listed in the WDR.

4.4 WATER QUALITY OBJECTIVES

4.4.1 Beneficial Uses

Beneficial Uses which in part dictate the level of treatment required for the effluent to be discharged to a receiving water have been identified and are contained in the City's WDR. Beneficial uses identified for the Kings River, downstream of the WWTP discharge, are:

- Municipal and domestic, industrial process, and agricultural supply
- Water contact and non-contact water recreation
- Warm fresh water habitat
- Wildlife habitat
- Groundwater recharge
- Beneficial uses identified for the groundwater in the area include municipal and domestic, agricultural, and industrial service and process supply.

4.4.2 Tulare Lake Basin Plan (Basin Plan)

The effluent quality in Reedley's WWTP discharge must meet the objectives developed in the Water Quality Control Plan for the Tulare Lake Basin (5D) Second Edition, 1995 (Basin Plan). The Basin Plan addresses water quality objectives for both surface and groundwater. The current WDR issued by the RWQCB has set discharge requirements consistent with the Basin Plan. The Basin Plan identifies the beneficial uses for the major rivers, creeks, and associated tributaries with the basin, and incorporates by reference plans and policies adopted by the SWRCB.

The Inland Surface Waters, Enclosed Bays and Estuaries Plan, discussed in the next section, covers discharge to surface waters, whereas the Basin Plan includes discharges to both surface and groundwaters. In the case of surface waters, the more stringent of the two plans governs. If the option of discharging effluent to the Kings River is maintained in the future, both plans should be addressed when projecting effluent requirements for the Reedley WWTP.

The Basin Plan cites numerical water quality objectives for waters designated as municipal supply. These are the maximum contaminant levels (MCLs) specified in the following provisions of Title 22, California Code of Regulations: Tables 64431-A (Inorganic

Chemicals) and 64431-B (Fluoride) of Section 64431, Table 64444-A (Organic Chemicals) of Section 64444, and Table 64449-A (Secondary Maximum Contaminant Levels Consumer Acceptance Limits), and 64449-B (Secondary Maximum Contaminant Levels Ranges) of Section 64449.

The Basin Plan contains narrative groundwater quality objectives that address constituents in the discharge that are potentially harmful to beneficial uses. Guidelines for identifying the quality of irrigation water necessary to sustain various crops were compiled by Ayers and Westcot in 1985 (Food and Agriculture Organization of the United Nations - Irrigation Drainage Paper No. 29).

The RWQCB has used the Ayers and Westcot guidelines in estimating the potential hazards to crop production associated with long-term use of the particular water being evaluated. The guidelines divide water quality characteristics as having relative degree of restriction on use.

As an example, the RWQCB included many of the guidelines from Ayers and Westcot (1985) in Reedley's WDR, in Finding No. 59. The guidelines, listed in Reedley's Finding No. 59 are presented in Table 4.5. The guidelines are used by the RWQCB to evaluate potential future uses of the groundwater underlying the WWTP.

Table 4.5 Numeric Guidelines for Irrigation Water
Wastewater Treatment Plant Master Plan
City of Reedley

Problem and Related Constituent	No Problem	Increasing Problem
Salinity of Irrigation Water (EC, μmhos/cm)	<700	700 - 3,000
Salinity of Irrigation Water (TDS, mg/L)[(1)]	<450	450 - 1,800
Specific Ion Toxicity from ROOT Absorption		
Sodium (mg/L)	<69	69 - 207
Chloride (mg/L)	<142	142 - 355
Boron (mg/L)	0.5	0.5-2.0
Specific Ion Toxicity from FOLIAR Absorption		
Sodium (mg/L)	<69	>69
Chloride (mg/L)	<106	>106

Table 4.5 Numeric Guidelines for Irrigation Water Wastewater Treatment Plant Master Plan City of Reedley		
Problem and Related Constituent	**No Problem**	**Increasing Problem**
Miscellaneous		
NH_4-N (mg/L) (for susceptible crops)	<5	5 - 30
NO_3-N (mg/L) (for sensitive crops)	<5	5-30
HCO_3 (mg/L) (only with overhead sprinklers)	<90	90 - 520
pH	Normal range = 6.5 - 8.4	
1. Assumes an EC;TDS ratio of 0.6:1		

The Basin Plan identifies the greatest long-term problem facing the entire Tulare Lake Basin as the increase in salinity in groundwater, which has accelerated due to the intensive use of soil and water resources by irrigated agriculture. The Basin Plan recognizes that degradation is unavoidable until a valley wide drain is constructed to carry salts out of the basin. Until the drain is available, the Basin Plan described numerous salt management recommendations and requirements. The latter includes the requirement that discharges to land from wastewater treatment facilities not have an EC greater than source water plus 500 μmhos/cm. If source water is from more than one source, the Basin Plan indicates that source water EC shall be a weighted average of all sources. Accordingly, the Basin Plan allows for salinity degradation and focuses on controlling the rate of increase.

4.4.3 Inland Surface Waters, Enclosed Bays and Estuaries Plan

In 2000, the SWRCB issued the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California. This document presents Phase 1 of the Inland Surface Waters Plan and the Enclosed Bays and Estuaries Plan, and is commonly referred to as the State Implementation Plan (SIP). The SIP contains provisions for implementing the pollutant criteria promulgated by EPA in the California Toxics Rule (CTR), the National Toxics Rule (NTR), and the water quality objectives adopted by the RWQCBs in their respective Basin Plans.

The CTR and the NTR establish water quality standards for toxic pollutants and create provisions for implementation of the standards. The objective of the SIP is to provide a standardized approach for permitting discharges of toxic pollutants to non-ocean surface waters. The SIP is also used in conjunction with the watershed management approaches to achieve the water quality standards designated in the regional Basin Plans.

4.4.3.1 Status of Reedley SIP Requirements

In order to comply with the SIP, Reedley's WDR required the City to provide information as to whether the levels of EPA's Priority Pollutants and NTR and CTR constituents in the discharge cause or contribute to an in-stream excursion above a water quality objective, including sampling for 2,3,7,8-TCDD and congeners (dioxin).

The Order also required the City to submit information to calculate effluent limitations for any constituents if the discharge has a "reasonable potential" to cause or contribute to an in-stream excursion above a water quality objective. The Order allows the RWQCB to reopen the WDR to include effluent limitations for these constituents.

In accordance with the WDR, Reedley conducted sampling of both the WWTP effluent and the Kings River water and completed a "Reasonable Potential Analysis" in 2003 (REF.1). The findings and implications are summarized in Section 4.4 of this chapter. The report is currently under review by the RWQCB.

4.5 BEST PRACTICABLE TREATMENT AND CONTROL (BPTC)

One of the main emphases of the City's WDR is to ensure protection of the groundwater underlying the WWTP. To accomplish this goal, several provisions require studies to determine that the groundwater will be protected. These provisions include a simple statement of the goal, requirements to characterize the groundwater, and specify studies to determine Best Practicable Treatment and Control (BPTC).

The primary goal is simply stated in Provision J.21:

"The Discharger shall use best practicable treatment and control of the discharge, including proper operation and maintenance, to comply with terms of this Order."

Groundwater studies are required to determine compliance with BPTC are presented in Provisions J.12 and J.13. These tasks are scheduled over a maximum four-year period. At the end of the studies, the City is to propose those improvements to the WWTP that will bring it into compliance with BPTC, and specific groundwater limits that reflect full implementation of BPTC.

4.5.1 BPTC Evaluation (WDR Provisions J.12 – J.15)

The purpose of the BPTC evaluation is to develop a strategy either to substantiate that the WWTP complies with the RWQCB's BPTC policy or to bring it into compliance. The analysis must be conducted for each component of the wastewater treatment system, solids handling facilities, reclamation activities (final discharge), operations and maintenance, and monitoring and reporting.

This BPTC policy is the outcome of the State Water Resources Control Board Resolution No. 68-16, known as the "Anti-Degradation Policy", although it predates the federal policy, and, is similar to the federal anti-degradation policy (40 CFR Section 131.12).

Specifically, Resolution No. 68-16 states the following:

1. *Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high qualities will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies.*

2. *Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the State will be maintained.*

Resolution No. 68-16 establishes in (1) above that where waters are of higher quality than required by State policies, such higher quality shall be maintained. The resolution also establishes the requirement in (2) that discharges to waters of the State shall be regulated to assure that the highest water quality is maintained. The discharges to waters of the State are required to use the best practicable treatment or control (BPTC) necessary to maintain the highest water quality. The resolution is not a zero discharge standard, but a policy that existing quality be maintained when it is reasonable to do so.

In order to comply with the policy, it is important to understand the intent of BPTC as determined by the RWQCB. The RWQCB determined that BPTC applies to both treatment and control of wastewater. Treatment includes processes designed to remove constituents from wastewater discharges to levels that will not adversely impact the quality of receiving waters. Examples would include treatment facilities at the WPCF and programs such as industrial pretreatment programs. Control includes containment of constituents so that degradation of receiving waters is minimized. Examples of control of discharge include eliminating or minimizing sewer infiltration or exfiltration and concrete treatment structures.

The term BPTC is not specifically defined by the Resolution. However, to determine BPTC compliance requires evaluating the treatment and control process at the WPCF for a given constituent that may have been demonstrated to be a constituent of concern (COC). The COCs for the WPCF will be identified during the BPTC evaluation but will be defined as a constituent that could impair the existing ground water quality.

Some of the factors that may be used for the BPTC evaluation include: comparing the proposed method to existing proven technology, evaluating performance data, comparing alternative methods of treatment or control, and considering the methods currently used by similarly situated discharges. Federal promulgated requirements such as best available technology economically achievable (BAT) may also be considered. Finally, the cost of the treatment and control can also be considered versus the maximum benefit to the people of the State.

4.5.2 Status of Reedley's BPTC Program

Reedley has completed a Preliminary Work Plan that established the procedure the City will use to conduct the BPTC evaluation (REF 2).

The Work Plan was approved by the RWQCB in July 2003. Given the delayed date of the approval, the compliance dates in the WDR were no longer reasonable. The RWQCB extended the compliance dates by Special Order in September 2003. The new compliance deadlines for the BPTC evaluation are February 2006 for WDR Provision J.14, and March 2006 for Provision J.13.

In October 2003, the City submitted the second BPTC work plan to the RWQCB, entitled "Work Plan for the Determination of Constituents of Concern for Best Practicable Treatment and Control (BPTC)" (REF 3). This second work plan, which was approved in December 2004 by the RWQCB, established an extensive wastewater and groundwater-monitoring program to gather the data necessary for the BPTC evaluation.

Currently, the City is conducting wastewater and groundwater studies to proceed with the BPTC evaluation, as described in the initial Work Plan (REF 2).

4.6 REASONABLE POTENTIAL ANALYSIS (RPA)

As stated in Section 4.3, the City of Reedley completed their RPA in 2003 (REF 1). This was in accordance with Provision J.6, which provided a time schedule for submitting an initial work plan, conducting effluent and receiving water sampling, and completing the RPA report.

The City was required by the RWQCB to assess the reasonable potential for the discharge of treated effluent from the WWTP to the Kings River to cause or contribute to an in-stream excursion above applicable water quality objectives. The WDR required an assessment of EPA's priority pollutants, including NTR and CTR constituents.

To satisfy this requirement, the City monitored the WWTP effluent and receiving water from 2001 to 2002. Five quarters of effluent monitoring data for organic constituents and seven quarters of effluent monitoring data for metals were collected and compiled. Four quarters of data of the receiving water were collected.

The RPA study involved identifying applicable water quality objectives for the Kings River, based on beneficial uses (from the Basin Plan), CTR criteria, US EPA and California

Department of Health Services (DHS) MCLs for drinking water. Water Quality Based Effluent Limits (WQBELs) were calculated for the constituents that were found to have "demonstrated reasonable potential."

4.6.1 Findings

Water quality criteria for the Kings River, downstream of the effluent discharge point, were calculated for 126 pollutants (Appendix B). The RPA concluded that the infrequent discharge to the Kings River does not have the reasonable potential to contribute to in-stream exceedances of applicable criteria. Nevertheless, WQBELs are required for three constituents: copper, lead, and zinc. The proposed limits are shown in Table 4.6. They apply only to direct discharge to the Kings River, and not to discharge to the ponds.
The RPA also concluded that the WWTP can comply with the effluent limits for copper and zinc, but that the effluent would exceed the lead limit. A compliance schedule of five years may be allowed, to come into compliance, and interim limits, which the WWTP could meet, would most likely be established by the RWQCB.

The effluent limits required by the RPA could be implemented by the RWQCB in a permit "reopener" and amendment, or the RWQCB could choose to wait until the WDR is up for renewal (2007). Based on the lack of response to date by the RWQCB to review the 2003 RPA, it is doubtful a permit reopener or amendment will be developed. It is more likely the RWQCB will address the RPA findings in the next permit renewal.

If the City chooses to discontinue the NPDES permit and commit to 100 percent land discharge, the findings of the RPA to establish new effluent limits and the requirements of the SIP would no longer be applicable to Reedley.

Table 4.6 Constituents Requiring Effluent Limitations - Reasonable Potential Analysis Findings
Wastewater Treatment Plant Master Plan
City of Reedley

CTR No.	Analyte	Units	Lowest Water Quality Criteria	Results		Proposed Effluent Limits	
				Maximum Effluent	Maximum Background	AMEL(1)	MDEL(2)
6	Copper	µg/L	4.6	8.9	2.8	120	340
7	Lead	µg/L	1.1	1.8	1.53	0.70	2.0
13	Zinc	µg/L	60	73.3	21.3	3500	5300

Notes:
1. Average Monthly Effluent Limit.
2. Maximum Daily Effluent Limit.

4.7 RECYCLED WATER REGULATIONS

Several agencies have regulatory authority or jurisdiction over potential projects using recycled water. The major state agencies include the DHS, the SWRCB, and the RWQCB. In addition to State regulatory agencies, there may also be involvement by county and local authorities. There are currently no federal regulations pertaining to water recycling.

The DHS is the primary State agency responsible for public health, whereas the SWRCB and the RWQCB are the primary State agencies charged with protection, coordination, and control of water quality. These agencies work together to develop discharge permits for recycling projects. Generally, the DHS interprets the laws dictated by the California Code of Regulations applicable to recycling and makes recommendations on individual projects to the RWQCB, which is overseen by the SWRCB. The RWQCB issues the final permit for the recycling project.

The existing water recycling regulations, which dictate wastewater treatment processes and effluent quality criteria, are contained in the California Code of Regulations, Title 22, Division 4, Chapter 3, Sections 60301 through 60355. A compilation of the water recycling regulations can be found in "The Purple Book," which can be found at http://www.dhs.cahwnet/gov/ps/ddwem/publications/waterrecycliing/purplebookupdate6-01.PDF. The regulations are intended "...to establish acceptable levels of constituents of recycled water and to prescribe means for assurance of reliability in the production of recycled water in order to ensure that the use of recycled water for the specified purposes does not impose undue risks to health..." The most recent revision to these regulations came into effect in 2001.

4.7.1 2001 Recycled Water Regulations - Recycled Water Quality

The DHS regulations define four types of recycled water determined by the treatment process and total coliform, bacteria, and turbidity levels. Although the DHS has not assigned type designations to the grades of recycled water defined by the current regulations, designations are provided here for clarity. The four treatment types of recycled water that are currently allowed are summarized in Table 4.7 and contained in Appendix C.

Article 3 of the Water Recycling Criteria details the acceptable uses of recycled water. Some of the uses specifically addressed include irrigation, impoundment, and cooling. The only exception noted for using recycled water is that the regulations shall not apply to on-site use at a water recycling plant, or wastewater treatment plant, provided public access is restricted to the area where reuse occurs.

In the case of the WWTP effluent, the facility meets the undisinfected secondary criteria based upon Title 22 regulations allowable uses for Reedley's effluent are listed in Table 4.7 and the section below.

4.7.1.1 Irrigation

Recycled water may be used for irrigation of various crops and landscapes. Recycled water specifically for the irrigation of the following must be disinfected tertiary recycled water:

- Food crops where the irrigation water comes into contact with the consumed portion of the crop;
- Parks and playgrounds;
- School yards;
- Residential landscaping; and
- Unrestricted access golf courses.

If the consumed portion of the food crop is produced above ground and recycled water does not contact the edible portion of the food crop, then disinfected secondary-2.2 recycled water must be used as a minimum standard. One recent clarification was made by the DHS in regards to orchard and vineyard irrigation using recycled water (see Appendix D). The position of the DHS Food and Drug Branch (FDB) is that undisinfected secondary recycled water, which was previously allowed, is not suitable for orchard and vineyard crops. The DHS states that it is "quite likely the crops will come into contact with recycled water or soil irrigated with recycled water through typical harvesting practices." As a result of this position, irrigation of orchard and vineyard crops must meet the requirements of disinfected secondary-2.2 recycled water. Since filtration would be needed to reliably meet a total coliform limit of 2.2 MPN/100 ML, this position effectively requires disinfected tertiary recycled water.

A minimum standard of disinfected secondary-23 recycled water must be used for irrigation of the following:

- Cemeteries;
- Freeway landscaping;
- Restricted access golf courses;
- Unrestricted access ornamental nursery stock and sod farms;
- Pasture for animals producing milk for human consumption; and
- Any non-edible vegetation where access is controlled so that the irrigated area cannot be used as if it were part of a park, playground, or schoolyard.

Recycled water used for the irrigation of the following must have a minimum standard of undisinfected secondary recycled water.

Table 4.7 Recycled Water Treatment Regulations
Wastewater Treatment Plant Master Plan
City of Reedley

Recycled Water Type	Treatment Process	Approved Uses	Median Coliforms (MPN/100 ml)
Disinfected Tertiary	Filtered [1] & Disinfected [2]	Spray Irrigation of Food Crops Landscape Irrigation[3] Nonrestricted Recreational Impoundment	2.2 [4]
Disinfected Secondary - 2.2	Oxidized & Disinfected [2]	Surface Irrigation of Food Crops Restricted Recreational Impoundment Surface Irrigation of Orchards & Vineyards[5]	2.2 [3]
Disinfected Secondary - 23	Oxidized & Disinfected [2]	Pasture for Milking Animals Landscape Irrigation[6] Landscape Impoundment	23 [3]
Undisinfected Secondary	Oxidized	Fodder, Fiber & Seed Crops	--

1. "Filtered" means an oxidized wastewater that satisfied (A) or (B) below:
   a. Has been coagulated and passed through natural undisturbed soils or filter media with a specified maximum flux rate depending on the type filtration system and does not exceed:
      1. an average of 2 NTU within a 24-hour period,
      2. 5 NTU more than 5 percent of the time within a 24-hour period, and
      3. 10 NTU at any time.
   b. Has been passed through a microfiltration, ultrafiltration, nanofiltration, or reverse osmosis membrane so that the turbidity does not exceed:
      1. 0.2 NTU more than 5 percent of the time within a 24-hour period, and
      2. 0.5 NTU at any time.
2. Disinfected by either:
   a. A chlorine process with a continuous concentration contact time (CT) 450 mg-mins/l with a modal contact time ≥ 90 minutes (based on peak dry weather design flow).
   b.A process combined with filtration that inactivates and/or removes 99.999% of F-specific bacteriophage MS-2, or polio virus.
3. Includes unrestricted access golf courses, parks, playgrounds, school yards, & other landscaped areas with similar areas.
4. For the last 7 days that analyses have been completed.
5. **No longer allowed**. The DHS has required that undisinfected secondary standards are not suitable, and that recycled water must meet disinfected secondary-2.2 requirements (see Appendix D).
6. Includes restricted access golf courses, cemeteries, freeway landscapes, and landscapes with similar public access.

- Non food-bearing trees;
- Fodder and fiber crops and pasture for animals not producing milk for human consumption;
- Seed crops eaten by humans;
- Food crops that must undergo commercial pathogen-destroying processing before being consumed by humans; and
- Restricted access ornamental nursery stock and sod farms.

4.7.1.2 Industrial Use

Industrial use of recycled water is not specifically addressed by existing regulations. These projects are considered on a case-by-case basis. Frequently the required effluent water quality is determined by the particular industrial process needs.

4.7.1.3 Impoundments

Recycled water that is used as a source of supply for non-restricted recreational impoundments shall be disinfected tertiary recycled water that has been subjected to conventional treatment. Disinfected tertiary recycled water that has not been subjected to conventional treatment may be used for non-restricted recreational impoundments provided it is monitored for pathogenic organisms. The total coliform bacteria concentration shall comply with the criteria specified for disinfected tertiary recycled water.

Restricted recreational impoundments and publicly accessible impoundments at fish hatcheries shall have a minimum standard of disinfected secondary-2.2 recycled water. Landscape impoundments without decorative fountains have a minimum standard of disinfected secondary-23 recycled water.

4.7.1.4 Cooling

Recycled water used for industrial or commercial cooling or air conditioning that involves the use of a cooling tower, evaporative condenser, spraying, or any mechanism that creates a mist shall be disinfected tertiary recycled water. If a mist is not created then the water shall be at least disinfected secondary-23.

Whenever a cooling system, using recycled water in conjunction with an air conditioning facility, utilizes a cooling tower or otherwise creates a mist that could come into contact with employees or members of the public, the cooling system must use a drift eliminator while in operation. In addition, chlorine, or other biocide, must be used to treat the cooling system recirculating water to minimize the growth of microorganisms.

4.7.1.5 Other Purposes

Disinfected tertiary recycled water may also be used for the following:

- Flushing toilets and urinals;
- Priming drain pipes;
- Industrial process water that may come into contact with workers;
- Structural fire fighting;
- Decorative fountains;
- Commercial laundries;
- Consolidation of backfill around potable water pipelines;
- Artificial snowmaking; and
- Commercial mechanical car washes.
- Recycled water used for flushing sanitary sewers shall be at least undisinfected secondary recycled water.

4.7.1.6 Other Methods of Treatment

If a treatment process is demonstrated to the DHS to meet Title 22 regulations, upon their approval, it may be implemented for water recycling.

4.8 PROBABLE FUTURE DISCHARGE REGULATIONS

Effluent quality requirements can be expected to become more stringent in the future, both in near-term and long-term horizons. As is typical for most cities, each revision of the WDR brings more stringent regulations and monitoring requirements for POTWs. Reedley is no exception.

4.8.1 Effluent limitations

The RWQCB has indicated that a total nitrogen limit is likely to be established in the City's future WDR, to protect the underlying groundwater. It is expected the limit will be 10 mg/L for total nitrogen. The limit could possibly be added to the City's next WDR, which is expected in 2007.

Effluent limits for zinc, copper, and lead (interim) could be established in accordance with the findings of the RPA (Section 4.6). If the City chooses to discontinue the Kings River discharge, and eliminate the NPDES permit (see Section 4.9), these effluent limits would not be required.

4.8.2 Groundwater Limitations

The groundwater limitations contained in the WDR are interim limits at this time (Table 4.4). They are subject to change, based on the outcome of the City's BPTC evaluation. The limits could become more stringent, less stringent, or eliminated (if the City can so justify). It is possible that limits for additional constituents may be recommended. Based on the progress of other Valley cities in their current BPTC evaluations, it appears likely that groundwater limits will continue for the salinity constituents listed in Table 4.4. The actual limits, however, may change.

4.8.3 Receiving Water (Kings River) Limitations

Since the new requirements for the SIP were added to the City's most recent WDR, leading to the preparation of the RPA, no significant changes to the receiving water limitations are anticipated for short-term planning horizon.

The receiving water limitations will not be required if the City chooses to discontinue the Kings River discharge and eliminate the NPDES permit.

4.8.4 Recycling Requirements

Section 4.7 summarized discharge requirements for the direct discharge of treated effluent to land for various types and locations of recycling efforts. The City is permitted to recycle effluent on the property under ownership by the City (see Section 4.3.7).

For a recycling program for the irrigation of nearby privately owned orchards and vineyards, new Water Reclamation Requirements (WRR) for the land area receiving the recycled water would be issued. The effluent criteria would have to meet disinfected secondary – 2.2 requirements. As stated in Section 4.7.1.1, in order to reliably meet the coliform limit of 2.2 MPN/100 mL, Carollo would recommend that the effluent be treated to tertiary levels prior to disinfection.

Disinfected tertiary treatment will be required for discharge to the Consolidated Irrigation District, Alta Irrigation District, landscaping, and golf course irrigation. A new WRR would be issued for privately-owned land in any of these programs.

The recommended process for the expansion of the WWTP is to produce undisinfected denitrified secondary effluent (Chapter 9). Once the upgrades are completed, the WWTP effluent would qualify for discharge to crops for restricted use on fodder, fiber, and seed crops (same as current qualification). A new WRR would be issued for this discharge also.

4.9 ELMINATION OF NPDES PERMIT

As stated in Section 4.3, the WWTP has not discharged to the Kings River since 1998. The City has maintained this option to discharge to the river in the WDR (limited to 1.75 mgd), primarily to handle an emergency situation in which the percolation pond capacity is exceeded during winter months. Since the WWTP's percolation pond capacity is more than adequate to handle flows up to 4.7 mgd, and there is sufficient land adjacent to the ponds to expand to 7 mgd, there is minimal benefit to maintaining the NPDES permit.

It is recommended the WWTP discontinue the option to discharge to the Kings River, thereby eliminating the NPDES permit from the WDR. The discharge option is simply not needed, and it is economically advantageous to eliminate the NPDES permit.

The advantages and disadvantages of continuing the river discharge and NPDES permit are summarized below.

Advantages of continuing the river discharge:

- Reliability. Provides a second disposal option, although limited to 1.75 mgd, in case of emergency.

Disadvantages of continuing the river discharge:

- WWTP chlorination facility would need to be upgraded to produce disinfected - 23 effluent, as required by the WDR.
- Monitoring of the Kings River upstream and downstream of the discharge point would be required, per the WDR. This results in additional annual costs to the WWTP in terms of additional staff time, laboratory fees, and extra reporting efforts.
- Effluent limits would be added for copper, zinc, and lead, as per the RPA. The WWTP would have difficulty meeting the lead limit, and additional treatment (or industrial pretreatment) may be needed to bring the effluent into compliance.
- Current effluent limits are more stringent than those for discharge to the pond system.
- Current monitoring requirements for the WWTP effluent are more extensive than the discharge to the pond system. Elimination of the NPDES permit would reduce monitoring time and annual costs.
- The NPDES permit is a federal permit and must be renewed every five years (more frequent than for land disposal WDRs). This brings additional costs to the city for permit negotiations, and brings the RWQCB more frequent opportunities to tighten the permit.
- The above requirements are costly and provide increasingly limited value for a discharge of only 1.75 mgd. Also, a new WDR would require filtration ahead of disinfection because the drain system under the ponds has not been successful.
- Violations of the NPDES permit are federal violations and subject to mandatory federal penalties (see Section 4.9.2 below).
- The above requirements are costly and provide increasingly limited value for a discharge of only 1.75 mgd. Also, a new WDR would require filtration ahead of disinfection because the drain system beneath the ponds has not been a successful filtration system.

4.9.1 Options to Revise WDR

There are two mechanisms by which the RWQCB can revise the WDR, if requested by the City. The first option is to issue a new WDR that does not allow discharge to the Kings River, and does not include the NPDES provisions. The second option is to amend the current WDR. In this case the RWQCB could issue a Special Order amending the WDR to withdraw authorization to discharge to the river. The Order would nullify the concomitant effluent discharge limits, provisions, and monitoring requirements, while allowing the balance of the WDR requirements to continue in full force.

Reedley has two options available to initiate this process. The first would be to wait until the next permit renewal cycle (2007). The second would be to initiate the process earlier, and request a Special Order amendment. Both situations will require Reedley to submit a Report of Waste Discharge (RWD) form indicating the requested termination of discharge location.

Initiating the process earlier than 2007 is advantageous, because once the Special Order is issued, the RWQCB would not be required to revise the permit in 2007. It is likely the next revision could then be deferred until 2009 or 2010, when the new permit for the plant expansion is issued.

4.9.2 Mandatory Minimum Penalties for NPDES Violations

Senate Bill 709 (SB709) authored by Carole Migden in 2000 requires the Regional Water Quality Control Boards (RWQCBs) to issue mandatory penalties for certain violations of NPDES permits. The minimum mandatory penalty (MMP) of $3,000 is required for each "serious" permit violation. A serious violation is any waste discharge that exceeds the effluent limitation for a Group I pollutant by 40 percent or more, or a Group II pollutant by 20 percent or more. Group I pollutants include BOD, TSS, nutrients, and other conventional wastewater constituents. Group II pollutants include most metals, cyanide, chlorine, and most organic compounds.

The RWQCB is also required to assess mandatory minimum penalties of $3,000 per non-serious violation, not counting the first three violations. A non-serious violation occurs if the discharger does any of the following four or more times in any period of six consecutive months:

a. exceeds WDR effluent limitations (including by less than 20 percent);
b. fails to file a required report of waste discharge;
c. files an incomplete report of waste discharge; or
d. exceeds a toxicity discharge limitation where the WDRs do not contain pollutant-specific effluent limitations for toxic pollutants.

The six-month time period was originally calculated as a "rolling" 180 days, however proposed changes may affect the interpretation of the six-month period. A single operational upset which leads to simultaneous violations of one or more pollutant parameters may be treated as a single violation. EPA defines "single operational upset" as "an exceptional incident which causes simultaneous, unintentional, unknowing (not the result of a knowing act or omission), temporary noncompliance with more than one CWA effluent discharge pollutant parameter. Single operational upset does not include... noncompliance to the extent caused by improperly designed or inadequate treatment facilities". The EPA Guidance further defines an "exceptional" incident as a "non-routine malfunctioning of an otherwise generally compliant facility." Single operational upsets include such things as upset caused by a sudden violent storm, a bursting tank, or other exceptional event and may result in violations of multiple pollutant parameters. The discharger has the burden of demonstrating a single operational upset occurred.

Water Code section 13385(j) includes several limited exceptions to the mandatory minimum penalty provisions, primarily for discharges that are in compliance with a cease and desist order or time schedule order under narrowly specified conditions. California Water Code section 13385(k) provides an alternative to assessing mandatory minimum penalties against a POTW that serves a small community, defined by Section 79084(b) as a municipality with a population of 10,000 persons or less.

4.10 BIOSOLIDS REGULATIONS FOR LAND APPLICATION

Currently, the WWTP disposes of biosolids by having a permitted land applier, McCarthy Farms, load, haul, compost and spread the biosolids on agricultural land in Kings County. Reedley's biosolids must be composted because the WWTP process does not treat the biosolids to the required level of pathogen destruction for direct land application. Chapter 10 evaluates composting and other alternatives to further treat the biosolids on site at the WWTP prior to off-site reuse.

This section provides a summary of the biosolids regulations that the WWTP must comply with for off-site reuse of biosolids now and into the future. Tables listing the various land application criteria are provided in Appendix E.

4.10.1 Overview

The major regulations that govern the application of biosolids at the reclamation area are the City's WDR, the U.S. EPA Sewage Sludge Regulations (40 CFR 503), the State Water Resources Control Board (SWRCB) Water Quality Order No. 2004-0012 - DWQ (General Order), and any county Biosolids Ordinance from the county where the biosolids are land applied.

Since Reedley sends their biosolids to an off-site facility, the City must comply with the 40 CFR 503 regulations (as they pertain to biosolids generators), the WDR specifications for proper treatment and disposal, and the Kings County regulations, since this is the county where the biosolids are land applied. Any off-site facility that would take the biosolids must be permitted by the RWQCB.

4.10.2 Federal Regulations (40 CFR 503)

The federal regulations, 40 CFR 503, became effective in 1994. The regulation is self-implementing and imposes requirements on the facilities that produce the biosolids and on the land appliers. The regulation establishes standards for pollutant limits, operational standards, management practices, and monitoring, record keeping, and reporting requirements. In order for the biosolids to qualify for land application, the biosolids must meet the maximum pollutant limitations for ten metals, and satisfy requirements for pathogen reduction and vector attraction reduction. This section provides a brief summary of the federal standards the biosolids must meet in order to comply with the 40 CFR 503 regulations.

4.10.2.1 Metals Limitations

The 40 CFR 503 regulations contain pollutant ceiling concentrations for metals that are the maximum allowable concentrations for any biosolids to be land applied (40 CFR 503.13 Table 1). In addition, there is a set of lower pollutant limits for biosolids to be defined as "exceptional quality" (EQ) biosolids (see 40 CFR 503.13 Table 3). Biosolids with pollutants above the 40 CFR 503 Table 1 ceiling limits cannot be applied to land. Biosolids with pollutants below the 40 CFR 503 Table 1 ceiling limits, but above the Table 3 limits, can be applied to land but are subject to annual and cumulative pollutant loading limits. Biosolids below the 40 CFR 503.13 Table 3 limits can be applied to land without regard to the annual or cumulative loading limits.

The Table 1 and Table 3 metals limits are listed in Appendix E.

4.10.2.2 Pathogen Reduction

In addition to pollutant concentrations, biosolids must not pose a public health risk. Performance-based pathogen reduction standards, contained in 40 CFR 503.32, classify biosolids as either Class A or Class B. The goal of Class A biosolids is to reduce pathogens to below detectable limits. The goal of Class B biosolids is to meet adequate pathogen reduction requirements and to rely on environmental factors at the reuse site to further reduce pathogens. Therefore, sites that use Class B biosolids must follow additional site restrictions concerning public access, animal grazing, and crop harvesting.

The Class A and Class B alternatives are provided in Appendix E.

4.10.2.3 Vector Attraction Reduction

Vector attraction is any characteristic that attracts disease vectors, such as insects or animals that may transport or transmit infectious agents. The 40 CFR 503 regulation specifies ten alternatives for meeting the vector attraction reduction requirements. One alternative must be met in order for biosolids to be land applied. The alternatives are provided in Appendix E.

4.10.2.4 Exceptional Quality Biosolids

EQ biosolids may be used and distributed in bulk or bag form and are not subject to general requirements and management practices other than monitoring, record keeping, and reporting to substantiate that the quality criteria have been met. EQ biosolids are exempt from cumulative loading rate restrictions on the soils. In order to be classified as EQ biosolids, the biosolids must meet the lower EQ pollutant limits, be classified as Class A, and meet one of the vector attraction reduction requirements.

4.10.3 General Order

In 2004, the State Water Resources Control Board (SWRCB) adopted general WDRs for the discharge of biosolids as a soil amendment. The WDRs are contained in Water Quality Order No. 2004 – 0012 - DWQ (General Order). The General Order is intended to streamline the regulatory process for land application sites statewide. Key provisions that go beyond the requirements of 40 CFR 503 are:

It is applicable for all land applied Class A and Class B biosolids, and essentially all EQ biosolids that contain more than 50 percent biosolids (i.e. compost blended with green waste, where the biosolids exceed 50 percent of the blend).

The discharger and the applier must file a Notice of Intent (NOI), which is a form and associated data, and submit a filing fee. A separate NOI and filing fee must be submitted for each landowner involved in a reuse project. If all requirements are met, then the RWQCB will issue a Notice of Applicability (NOA). For comparison, the self-implementing 40 CCFR 503 regulations do not require application forms or pre approvals.

The 40 CFR 503 pollutant ceiling concentrations must be met. In addition, the General Order contains a molybdenum limit of 75 mg/kg and a cumulative loading limit of 16 lbs/acre. Cumulative loading limits are required for all sites, even those that receive EQ biosolids. Background soils concentrations must be measured and used to calculate cumulative loading limits on the soils. This reduces the overall effective cumulative loading limit for any given site. The metal limits are listed in Appendix E.

In addition to metals and nutrients, biosolids must be monitored annually for pesticides and PCBs (EPA Method 8080) and semi-volatile organics (EPA Method 8270).

Biosolids must be incorporated into the soil within 24 hours in arid areas.

To protect from dust and blown particulates, biosolids with a moisture content less than 50 percent moisture cannot be land applied. Depending on the biosolids density, this may correspond to a maximum dryness of 50 to 60 percent solids.

Class B biosolids within a half mile of sites with a high potential of public exposure (schools, parks, hospitals, etc) shall be injected.

Annual plant tissue testing for molybdenum, copper, and selenium is required.

Previously undisturbed lands or sites that lay fallow for a period of more than one year (excluding land that has been disked or tilled) must have a biological site assessment completed to identify special-status species.

Individual owners of the property at which the land application occurs are ultimately responsible for ensuring compliance with the General Order.

4.10.4 Future Trends for Biosolids Land Application

A disturbing trend throughout California is the elimination of biosolids land application. Counties that have banned, or practically banned, all biosolids applications include Shasta, Lassen, Glenn, Yuba, Lake Sutter, Contra Costa, San Joaquin, Stanislaus, Madera, Santa Cruz, Monterey, San Benito, Tulare, San Bernardino, and Imperial. Other counties, such as Fresno, Kings, Kern, and Riverside have passed ordinances banning land application of Class B biosolids.

There is a question if building an on-site facility for treating biosolids to Class A would be cost effective for WWTPs in the Valley. There does not appear to be a "disposal cost incentive" for a WWTP to produce Class A biosolids on-site, prior to land application off-site by a private contractor. Based on conversations with private contractors, they would not likely give a price cut to a WWTP who produced Class A sludge on-site. An exception might be made for a very large facility, with a proven on-site compliance record.

For very large facilities, such as Fresno, an on-site Class A treatment facility might be cost effective for long-term off-site disposal. But for smaller dischargers (i.e., Reedley), the annualized costs for such a large capital project would most likely greatly exceed the annual costs for using privatized contractors to haul away the material.

Centralized incineration/cogeneration facilities are being built elsewhere in the State and may be feasible in the future in the Valley. The advantage to incineration is that less treatment of biosolids is preferred in order to maintain higher concentrations of organics in the material. Nondigested biosolids (subclass B), which are what Reedley produces, are best.

4.11 AIR REGULATIONS

The San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) issues the emissions permit for the WWTP based on both the Federal Clean Air Act (CAA), which has created a comprehensive national framework designed to protect ambient air quality by limiting air emission from both stationary and mobile sources, and California's comprehensive state air quality control program.

4.11.1 San Joaquin Valley Unified Air Pollution Control District (SJVUAPCD) Regulations

4.11.1.1 Overview

The Federal Clean Air Act (FCAA) requires the EPA to set National Ambient Air Quality Standards (NAAQS) for several problem air pollutants to protect human health and welfare. Standards were established for carbon monoxide, ozone, fine particulate matter (PM), nitrogen dioxide, sulfur dioxide, and lead. Of these criteria pollutants, the San Joaquin Valley Air Basin (SJVAB) does not meet the standards for ozone and PM. The FCAA requires that the California Air Resources Board prepare an air quality control plan – the State Implementation Plan (SIP) – that contains the strategies and control measures that California will use to attain the NAAQS.

The California Air Resources Board (CARB) is the agency responsible for coordination and oversight of state and local air pollution control programs in California and for implementing the California Clean Air Act of 1988 (CCAA). CARB has also developed state air quality standards, which are generally more stringent than federal standards. Other CARB duties include monitoring air quality in conjunction with local air districts, setting emissions standards for new motor vehicles, and reviewing district input for the SIP. The SIP consists of the emissions standards for vehicles and consumer related sources set by CARB, and attainment plans and rules adopted by the local air districts.

The SJVUAPCD has the primary responsibility for control of air pollution from sources other than motor vehicles and consumer products in the SJVAB: Fresno, Kings, Tulare, Madera, Stanislaus, San Joaquin and Merced Counties, and the Valley portion of Kern County.

The APCD is responsible for preparing attainment plans for each nonattainment criteria pollutant (ozone and PM) for which it does not meet the standard. Separate SIPS for each of the criteria pollutants must be adopted by the APCD and ARB and submitted to EPA. Currently, the SJAB is classified as an extreme ozone nonattainment area and a serious PM10 nonattainment area for the health-based air quality standards established by the federal Clean Air Act. The SJVAB is also classified as severe nonattainment for the California ozone standard and nonattainment for the California PM10 standard.

4.11.1.2 Background

Air Pollution Control District activities include rule development and enforcement, monitoring of air quality, a permit system for stationary and mobile air pollution sources, air quality planning, protection of the public from the adverse affects of toxic air contaminants, and responses to public requests for information regarding air quality issues.

The SJVUAPCD administers rules and regulations that apply to stationary and mobile sources that emit air contaminants in the San Joaquin Valley Air Basin. SJVUAPCD regulations are separated into nine categories, summarized in Table 4.8.

Regulations I, II, and III give administrative details and requirements for regulation in the form of permits, fees, and hearing board procedures. Generally, new and existing stationary sources are governed by requirements in Regulations II and IV. Regulation IV contains rules governing emission of conventional pollutants, visible emissions, nuisances (odors), and references the National Emission Standards for Hazardous Air Pollutants (NESHAPs). Regulation VIII contains rules governing fugitive dust emissions.

Table 4.8 San Joaquin Valley Unified Air Pollution Control District Regulations
Wastewater Treatment Plant Master Plan
City of Reedley

Regulation	Description
I	General Provisions
II	Permits
III	Fees
IV	Prohibitions
V	Procedures Before the Hearing Board
VI	Air Pollution Emergency Contingency Plan
VII	Toxic Air Pollutants
VIII	Fugitive PM_{10} Emissions
IX	Mobile and Indirect Sources

For this report, the regulations that specify prohibitions and/or compliance limits that are applicable to wastewater treatment facilities are separated into two categories that impact major and minor treatment plant operations.

Prohibitory Rules applicable to major treatment plant operations are listed in Table 4.9. The rules include emission limits for conventional pollutants (NOx, SOx, CO, VOCs), non-conventional pollutants (i.e. metals), visible emissions, odors (nuisance), fugitive dust emissions, and particulates.

Table 4.10 lists the prohibitions governing minor treatment plant equipment and operations. These regulations include gasoline storage and dispensing, painting of equipment, and use of volatile solvents. Though important for compliance, these "minor" activities are not in the scope of this document.

At the Reedley WWTP, sources of conventional air contaminants are predominantly derived from the operation of equipment fueled by diesel fuel (standby generator). Other sources of air contaminants are derived from fugitive emissions from wastewater processes.

Table 4.9	SJVUAPCD Prohibitory Rules Governing Major Treatment Plant Operations Wastewater Treatment Plant Master Plan City of Reedley		
Rule No.	**Title**	**Requirements**	**Facilities and Operations Affected**
4101	Visible Emissions (Ringelmann Scale)	• Opacity less than Ringelmann Standards	Combustion Equipment
4102	Nuisance	• No Emissions Causing Nuisance and Annoyance	Odor Generating Facilities
4201	Particulate Matter Concentration	• <0.1 grain/cf	Engine vents and scrubber stacks
4701/ 4702	Internal Combustion Engines	• NO_x, CO, VOC Emission Limits • Emission Control Plan • Compliance Testing	Internal Combustion Engines >50 hp, Special Categories for Water/Wastewater Treatment Facilities, limited exemption for standby engines
4801	Sulfur Compounds	• Sulfur <0.2 Percent, (as SO_2)	Combustion of Diesel Engines
8011	Fugitive PM10 Prohibitions	• Management Plan (if vehicle traffic exceeds 75 vehicle trips per day)	Unpaved Roads and Unpaved Vehicle/Equipment Traffic Areas
8021	Construction, Demolition, Excavation, and Other Earthmoving Activities	• Dust Control Measures	Construction Related Activities
8031	Bulk Materials	• Control Requirements to limit dust during handling, storage, and transport (on- and off-site)	Dried Sludge Handling Operations

4.11.2 SJVUAPCD Permitting Process

Rule 2010 specifies a "two-tiered" permitting process for the SJVUAPCD. The permitting process governs the construction, replacement, operation or alternation of any source operation that emits or may emit contaminants. The two-tiered process includes an "Authority to Construct" (ATC) followed by a "Permit to Operate" (PTO). ATC and PTO permits are generally required for the construction, modification, replacement, or operation of combustion sources (i.e. flares, incinerators, engines). The SJVUAPCD has indicated that, in the future, permits may be required for noncombustion facilities or operations that emit or have the potential to emit air contaminants.

Table 4.10 SJVUAPCD Prohibitory Rules Governing Minor Treatment Plant Operations Wastewater Treatment Plant Master Plan City of Reedley

Rule No.	Title	Requirements	Facilities and Operations Affected
4601	Architectural Coatings	• VOC Content Limits • Labeling Requirements	All Painting of Structures, Pavements, Curbs or Trailers
4603	Coating of Metal Parts and Products	• VOC Content Limits • VOC Emissions • Equipment	Coating or Painting of any Metal Part or Equipment
4621	Gasoline Transfer to Storage	• Vapor Recovery Systems	Gasoline Storage
4622	Gasoline Transfer to Vehicle Fuel Tanks	• Vapor Recovery Systems	Gasoline Pumps
4662	Organic Solvent Degreasing Operations	• Various Requirements by Category	Maintenance Degreasers

The APCD's New and Modified Stationary Source Review (NSR) program is designed to meet both the state and federal NSR requirements for nonattainment areas, and applies to new and modified stationary sources that emit NOx, VOC, PM-10, SOx, CO and other pollutants subject to District permit. Rule 2201 was recently amended in response to the reclassification of the SJVAB federal one-hour ozone attainment status to extreme nonattainment. In conjunction with amendments to Rule 2201, the District also amended Rule 2530 (Federally Enforceable Potential to Emit) which provides facilities with consistently low emissions mechanisms to escape Title V permitting requirements. The District was obligated to submit revised NSR and Title V rules reflecting "extreme" classification to the EPA as required in the reclassification to extreme nonattainment for the one-hour ozone standard. However, the State of California is challenging EPA's arguments relative to federal NSR reforms on the basis that California has more stringent NSR requirements. The District is currently faced with the federal requirement to incorporate the federal NSR reforms, while state law specifically forbids the District from relaxing key components of the NSR review. Currently, the revised Rule 2201 satisfies the state requirements that no NSR rules can be made less stringent that the rules that existed on

December 30, 2002. The lawsuit is ongoing at this time and the District is deferring additional amendments to Rule 2201 pending the outcome of litigation.

4.12 GROUNDWATER PLUME MANAGEMENT

The current effluent reclamation method is to percolate to the near surface groundwater. Water quality of the underlying groundwater has been well characterized in recent years, using data collected from 14 monitor wells that are located at or near the WWTP (REFs 4 and 5). The City has made progress in addressing groundwater issues over the last decade, and the groundwater quality has improved. This has been demonstrated through studies the City has conducted as required by the RWQCB in the previous 1995 WDR and the current WDR (adopted in 2001).

According to the 2002 Hydrogeologic Study (REF. 5) seepage from the percolation ponds contains moderate nitrate concentrations (about 25 mg/L), which is well below the MCL of 45 mg/L. Seepage from the former unlined sludge drying beds resulted in nitrate concentrations ranging from 100 mg/L to 150 mg/L in the shallow groundwater near the drying beds. Since the use of the beds was discontinued in 1997,the nitrate concentrations in the affected groundwater have generally decreased. Two new shallow monitor wells have been proposed to better delineate the north boundary of the high nitrate groundwater. Additionally, the City has proposed pumping the groundwater from two of the wells near the sludge beds, and discharging the extracted water back into the percolation ponds, increasing the nitrate concentration in the discharge to the ponds slightly, by only 1.16 mg/L.

The proposed expansion project at the WWTP will include a nitrogen removal treatment process to bring effluent total nitrogen concentrations down below 10 mg/L (see Chapter 9). This will result in the achievement of the groundwater objective for nitrogen.

The City's new WDR has required the City to develop and implement best practicable treatment and control (BPTC) to prevent degradation of the underlying groundwater (Section 4.5). The City is on track with the BPTC studies. They are currently conducting wastewater and groundwater sampling studies for use in the BPTC evaluation. The data will be used to determine if there are any constituents of concern that should be mitigated through BPTC.

EFFLUENT REUSE EVALUATION

5.1 SUMMARY

The City's percolation practice continues to be the recommended approach for effluent reclamation. The City does not need any additional ponds until flows exceed 4.69 mgd. If flows increase as projected in Chapter 3, this will occur around the years 2020 to 2025. Prior to reaching the 4.69 mgd pond capacity, the City will need to construct an additional 18-acre percolation pond to provide capacity for an ultimate design flow of 6.88 mgd.

The proposed upgrade to the WWTP will treat the wastewater to undisinfected secondary level (current level of treatment). Effluent recycling does not appear to be feasible at this time to justify a higher level of treatment. Based on previous studies, the costs to upgrade to tertiary levels and deliver the effluent to neighboring orchards and vineyards would be approximately $5.6 million for today's flows (2.5 mgd). Disinfection costs would be additional.

Five alternatives for effluent recycling that had been previously studied were reviewed. The alternatives are all infeasible and impractical, as was concluded in 1997: The first three alternatives (direct irrigation on privately owned orchards and vineyards, discharge to Consolidated Irrigation District, and landscape irrigation) all require disinfected tertiary effluent, at the construction costs mentioned above. The fourth alternative (discharge to UC Kearney Ag Field Station) is infeasible, due to lack of interest by the UC. The fifth alternative (irrigating undisinfected secondary effluent on city-owned farmland) would require significantly high capital costs for land purchase.

5.2 BACKGROUND

The City of Reedley (City) Wastewater Treatment Plan (WWTP) has two effluent discharge points allowed by their Waste Discharge Requirements, Order No. 5-01-257 (WDR). The first discharge is to the City's percolation ponds (Discharge 001) and the second discharge is to the Kings River (Discharge 002). The WDR limits flow to the Kings River to 1.75 mgd. The permitted flow to the percolation ponds is 3.5 mgd.

The WWTP currently discharges 100 percent of their effluent to the percolation ponds. The WWTP previously discharged to the Kings River at times when the percolation ponds could not accommodate the flows. However, the City implemented a pond maintenance program to increase percolation rates and has not had to discharge to the Kings River since July 1998.

5.3 PERCOLATION POND WATER BALANCE

The WWTP currently has seven percolation ponds for effluent disposal (Figure 5.1). The total area (including side slopes) and surface area of each pond is provided in Table 5.1. The total area of the ponds is 39.29 acres and the surface area of the ponds is 33.13 acres. The total current storage capacity of the ponds is 160 acre-feet, allowing for two feet of free board.

Table 5.1 Percolation Pond Design Criteria
Wastewater Treatment Plant Master Plan
City of Reedley

Pond	Pond Area (acre)	Surface Area (acre)
1	3.32	2.74
2	7.52	6.79
3	7.29	6.30
4	3.65	2.58
5	3.85	2.47
6	1.82	0.95
7	11.85	11.30
Total	**39.29**	**33.13**

Future expansion projects at the WWTP include the addition of a clarifier and an oxidation ditch. With the addition of these facilities, it is expected that all of Pond 6 and half of Pond 1 will be taken up by the new structures. The total acreage will then be approximately 36 acres and the surface area will be approximately 31 acres. The available storage capacity will be 150 acre-feet.

The Reedley WWTP has established a pond maintenance program of disking pond bottoms to increase percolation rates. The City does not have actual measured data for determining the percolation rate, but the City has consistently discharged an average of 2.5 mgd to only one to three ponds at any given time. The effluent loading rate is estimated at 0.8 to 1.3 feet per acre. The data sheets for the pond cycling program for 2003 and 2004 are provided in Appendix F.

A percolation rate of 0.5 feet/day was used for the water balances. This is consistent with the percolation rate reported in the City's WDR and appears conservative based on the City's current pond cycling program and high loading rates that are achieved.

Two water balances were prepared to evaluate the need for additional percolation ponds to handle future flows. The water balances were based on the assumption that all ponds would be used at the same time to maximize percolation. The water balances are provided in Appendix G. The water balances used:

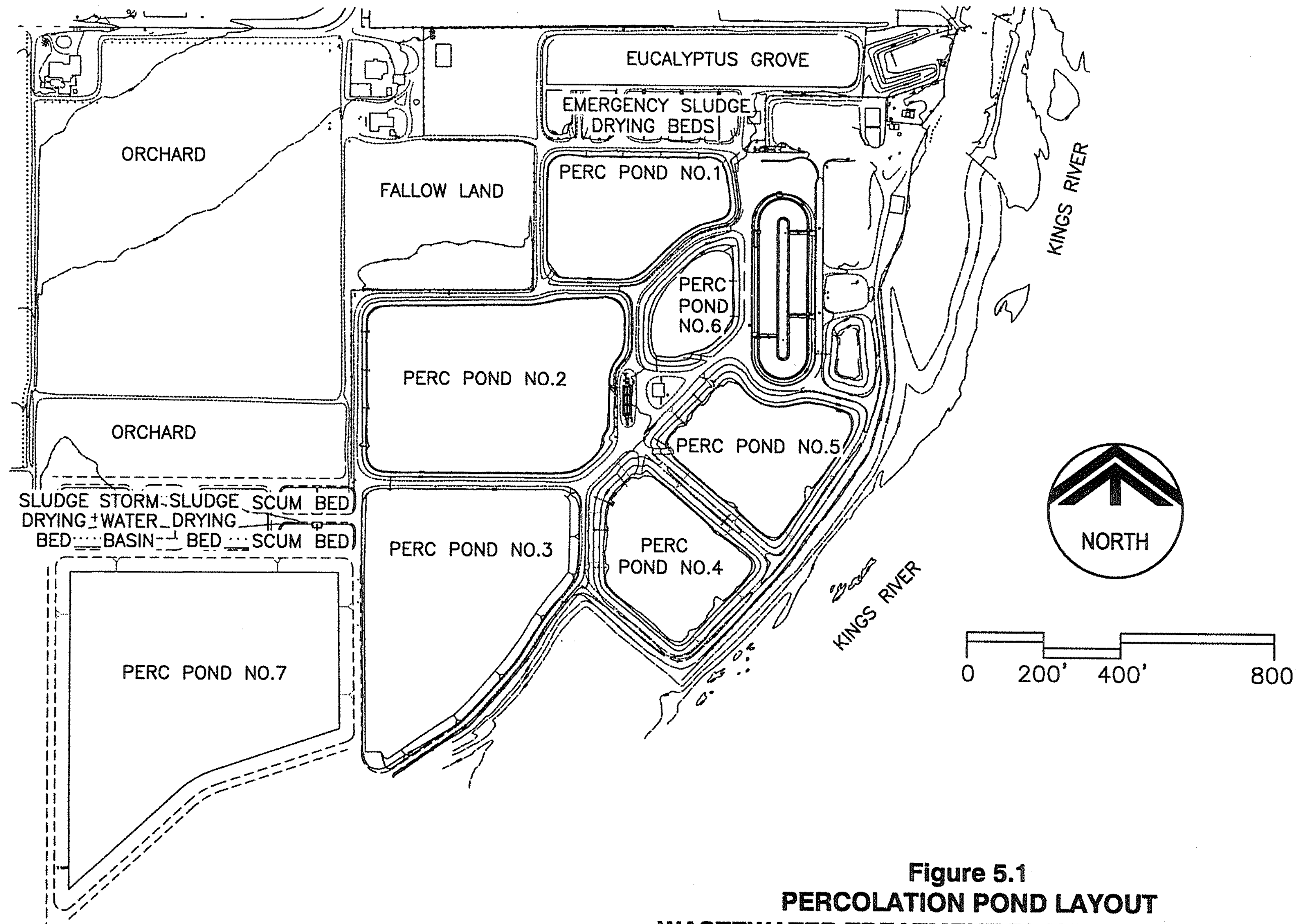


Figure 5.1
PERCOLATION POND LAYOUT
WASTEWATER TREATMENT PLANT MASTER PLAN
CITY OF REEDLEY

carollo engineers

H:\Client\Reedley_FNO\6294G00\Dwg\Fig 5-1 11-18-05 10:28am rgiarta XREFS:

- Pond surface area of 31 acres and 150 acre-feet of storage capacity
- Percolation Rate of 0.5 feet per day
- 100 year Rainfall data for Reedley area (Appendix G)
- Lake evaporation rates based on San Joaquin Valley Class A pan evaporation rates and DWR data (Appendix G)

The first water balance was developed to estimate the capacity of the current pond system. The water balance estimates that the pond system capacity is 4.69 mgd. The water balance is based on maximizing percolation capacity. The available pond storage capacity is significantly greater than the volumes that would accumulate, demonstrating there is more than adequate storage capacity for 100-year storm event.

The second water balance was developed to estimate the additional pond acreage that will be needed at future flows for the year 2030. The water balance shows that the City would need approximately 15 additional acres of ponds for a design flow 6.88 mgd. It is assumed that the future pond would be built with a 3:1 slope and maximum water depth of 5 feet with 2 feet of freeboard. The maximum volume of water that would accumulate in the ponds for this water balance is 89.54 acre-feet. This is well below the future available storage volume of 216 acre-feet. Again, this demonstrates there will be more than adequate capacity for storm events.

For construction purposes, the City should assume that the required acreage to build the future pond will be 18 acres, or 20% above the estimated area to allow for dikes and roads. Since the new pond area will not be needed until flows reach 4.7 mgd, it will not be included in the proposed expansion project.

5.3.1 Options for Increasing the WWTP Permitted Effluent Disposal Capacity

Chapter 4 discussed the mechanisms by which the City will obtain the next WDR. During the development of the WDR, it is recommended the City negotiate with the RWQCB for a two-tiered permit regarding the plant's permitted capacity. Two-tiered permits are common for cities that are undergoing expansions in phases.

The first tier of the WDR would provide an immediate permitted flow of 4.7 mgd, based on the estimated capacity of the current pond system. The second tier would provide a permitted flow of 6.9 mgd, that would implemented in the future when the additional permitted capacity is needed. The WDR would specify that, in order to increase the permitted flow to 6.9 mgd, the City shall provide technical justification and certification that the WWTP has 6.9 mgd of disposal capacity.

The 6.9 mgd disposal capacity would be achieved by building the additional 18 acres of percolation ponds prior to reaching 4.7 mgd. However, since the water balance is conservative, it is likely the pond system will provide capacity beyond 4.7 mgd, and the full 18 acres may not be needed. It is recommended that, as flows approach 4.7 mgd and the impact of higher flows on the pond system is known, the City conduct on-site percolation tests to better define pond capacity and the acreage needed for 6.9 mgd. If fewer acres are needed, or the timing of the pond construction can be deferred beyond 4.7 mgd, the City would document this in their request to increase the permitted capacity.

5.4 TITLE 22 ALLOWABLE CROP USES

The regulation that governs effluent quality criteria and management requirements for water recycling are contained in the California Code of Regulations Title 22, Division 4 (Title 22) (see Chapter 4). The regulations were established in 1978, and revised in November 2000. Title 22 Chapter 3 defines the various levels of treatment and disinfection, the allowable uses of recycled water, and management requirements for the reclamation areas.

Reedley's undisinfected secondary effluent meets the criteria for "oxidized" wastewater according to Title 22 (see Table 4.7). Table 8.5 lists the limited allowable uses of Reedley's effluent.

Table 5.2 Allowable Crops for Surface Irrigation of Undisinfected Secondary Recycled Water(1)
Wastewater Treatment Plant Master Plan
City of Reedley

•	Nonedible vegetation with access control to prevent use as a park, playground, or school yard
•	Fodder crops (e.g. alfalfa) and fiber crops (e.g. cotton)
•	Seed crops not eaten by humans

(1) Partial list. See CCR Title 22, Section 60304 (c) and (d)

5.5 SUMMARY OF PREVIOUS RECYCLE STUDIES

Two reports were completed that addressed potential WWTP effluent irrigation options. The first was prepared by Carollo Engineers in August 1993 and was titled "Master Plan for Wastewater Treatment and Disposal Facilities" (1993 Master Plan). The plan recommended that the City pursue an irrigation program to irrigate 450 acres by the year 2013. Appendix H contains a map of the potential reclamation area. The justification for pursuing an irrigation program was the increasing restrictions on surface water discharges and upcoming groundwater regulations.

The second report is the "Wastewater Reclamation Feasibility Study", prepared by Provost and Pritchard in April 1997 (1997 Study). The report expanded on the 1993 Master Plan and provided an in depth evaluation of the advantages, disadvantages, cost effectiveness, and feasibility of applying effluent to five alternatives. The alternatives included:

- Alternative 1. Direct Farm Irrigation - Privately Owned Land
- Alternative 2. Consolidated Irrigation District (CID) - East Branch Smith - Ferry Canal
- Alternative 3. Landscape and Selma Golf Course Irrigation
- Alternative 4. UC Kearney Ag Field Station
- Alternative 5. Irrigation of City Owned Farmland

A summary of the alternatives is provided in Appendix I. The findings concluded that reclamation via irrigation was not cost effective or feasible. Alternative 1, which in 1997 required undisinfected secondary-23 effluent, would now require disinfected tertiary effluent. Alternatives 2 and 3 would require disinfected tertiary effluent. Alternative 4 was eliminated due to lack of interest by the field station. Alternative 5 was not cost effective with the insignificant amount of land available to the City for recycling.

In addition, both reports concluded that there is not a market to sell the effluent water since less expensive options include groundwater or CID water. Therefore, there is no revenue stream from recycling considered in the cost options. This assumption is still valid today.

5.5.1 Review of Alternatives

This section updates the alternatives and conclusions that were developed in the1997 Study (see Appendix I). Three significant changes have occurred since the 1997 Study that update the alternative analysis:

1) The Department of Health Services, in their letter dated January 8, 2003 has increased the restriction of effluent irrigation of orchard and vineyard crops to disinfected secondary-2.2 effluent (see Chapter 4 and Appendix D). However, in order to reliably meet the disinfected secondary-2.2 requirements, the WWTP would need to be upgraded to provide disinfected tertiary facilities. Therefore, the level of treatment previously considered in 1993 and 1997 for orchards and vineyards (disinfected secondary-23) is no longer allowed. This increases the unit costs developed in the previous studies.

2) The proposed upgrade to the WWTP (Chapter 9) will produce a denitrified undisinfected secondary effluent, with total nitrogen concentrations less than 10 mg/L. Therefore, the nitrogen content will not be a limiting factor for irrigation, and larger volumes of effluent could be applied to crops than considered in previous studies. While this allows a greater potential land area for recycling, it will not affect the estimated costs derived in the previous studies.

3) Alta Irrigation District (AID) was not considered in the previous reports as one of the irrigation districts willing to take effluent. A phone call was made to Chris Capine of

the AID that confirmed AID would be interested in taking effluent. The City would need to provide disinfected tertiary treatment and the City would have to pump the water across the Kings River to access the AID system. This opportunity would not affect the estimated costs derived in the previous studies.

5.5.1.1 Alternative 1. Direct Farm Irrigation - Privately Owned Farmland

This alternative considered irrigating neighboring farmland that is planted primarily stone fruit and some vineyards. In the 1997 Study, the level of treatment was established as disinfected secondary-23. Based on the new DHS requirement for disinfected tertiary for orchards and vineyards, the prospect of irrigating privately owned farmland near the WWTP would involve higher costs for treatment than originally estimated.

This alternative would require the construction of an effluent pump station, tertiary treatment and disinfection facilities, and distribution pipelines. The 1993 and 1997 studies assumed 1.5 miles of pipelines. Other considerations for this alternative are:

- The orchard and vineyard irrigation season is from March to October. Therefore, the new facilities (pump station, tertiary treatment, disinfection, and pipeline), would not be needed in the winter months,
- All potential reclamation areas are of higher elevation than the WWTP and would require pumping,
- Landowners would be required to accept long-term agreements to accept the recycled water,
- Produce buyers may prefer not to purchase crops irrigated with recycled water, thereby resulting in reluctance by growers to participate in the irrigation program,
- Most parcels near the WWTP are 10 to 50 acres. Therefore, multiple agreements would need to be made for effluent use, and
- Irrigation District and/or well water are readily available and less expensive.

The 1997 Study concluded the need to dilute effluent 50/50 with fresh water because the total nitrogen concentration was too high in the effluent. This will no longer be an issue after the upgrades to the WWTP are completed. Therefore, the City could deliver effluent to more land than previously considered.

More detail on the advantages and disadvantages from the 1997 study are provided in Appendix I. The 1997 Study listed the capital costs for this alternative as $510,000 capital costs (1993 dollars). Escalated to 2005 dollars, these costs would be $672,000. The costs pertain to construction of a 1.5 mile pipeline, and do not include a pump station, tertiary treatment, or disinfection. Therefore, the costs for this alternative would be closer to the costs provided for Alternative 2 below ($5.6 million capital costs, in 2005 dollars). Disinfection costs would be additional.

Based on the high costs and the fact that existing water sources are both inexpensive and plentiful, the conclusion remains the same as stated in 1997, that this alternative is not cost effective at this time.

5.5.1.2 Alternative 2. Consolidated Irrigation District - East Branch Smith - Ferry Canal

Consolidated Irrigation District was contacted during the 1993 Master Plan and the 1997 Study. Mr. Gene Branch of CID was contacted again during this report and verified that CID's position and restrictions on WWTP effluent remains the same as the previous reports. A list of some of CID's requirements are listed below:

- Effluent must meet disinfected tertiary standards,
- Wastewater must be held in storage tanks prior to discharge to test water quality,
- Deliveries would be limited during the months of May though July, and
- Discharge must have a dilution ratio of 20:1.

According to the 1993 Master Plan, a total of 885 acre-feet of water could be used annually, or approximately 34 percent of current effluent flows.

In addition to the requirements listed above, the City would need to construct tertiary disinfection facilities, a pump station and 3/4 miles 30-inch diameter pipeline. The cost for this alternative was estimated at $4.3 million in 1993 ($5.6 million in 2005 dollars). As with the previous alternative, the cost estimate did not include disinfection facilities, which would be additional.

Based on the high capital costs and the fact that existing water sources are both inexpensive and plentiful, the conclusion remains the same as stated in 1997, that this alternative is not cost effective at this time.

5.5.1.3 Alternative 3. Landscape and Golf Course Irrigation

The 1997 Study evaluated the alternative to recycle effluent on landscaped areas around the City of Reedley, Reedley College, and a golf course. The total area was assumed to be 120 acres. Disinfected tertiary effluent would be required. As stated in the 1997 study, the base cost for this alternative would be the same as Alternative 2 ($5.6 million in 2005 dollars). Additional costs would be needed to build a disinfection facility and distribution system for the proposed area.

This alternative would recycle 461 acre feet/year, or 17 percent of the City's annual effluent flow. Based on the high costs and the limited quantity of effluent that would be recycled, the conclusion remains the same as stated in 1997, that this alternative is not cost effective at this time.

5.5.1.4 Alternative 4. UC Kearney Ag Field Station

The UC Kearney Ag Field Station was contacted during the 1997 Study and it was determined that they were not interested in utilizing recycled water for irrigation. A recent phone call to Mr. Fred Swanson confirmed that the UC's position has not changed. Therefore, this alternative is not feasible.

5.5.1.5 Alternative 5. Irrigation of City Owned Farmland with Undisinfected Secondary Effluent

The 1997 Study evaluated irrigation of 23 acres within the WWTP site with undisinfected secondary effluent as a demonstration project. This alternative is expanded in this section to also include the option of the City to purchase land to meet effluent disposal needs.

The City currently has approximately 20 acres planted in orchards. In early 2005, the land was leased to a local farmer for 10 years. Due to the DHS requirement for disinfected tertiary effluent on orchards, this land cannot be irrigated unless the farmer removed the orchard crop and plant fodder crops. An irrigation schedule was calculated for alfalfa and is provided in Appendix J. The schedule shows that the City could apply 4.0 feet/acre/year of effluent to an alfalfa crop, assuming that the effluent nitrogen concentration is 10 mg/L. At this application rate, the City could irrigate 92 acre-feet per year. This is only 3 percent of the current effluent flow. Due to the small volume of water that can be utilized, the costs to convert the farmland, the inconvenience to the farmer to change crops, and the need to convert this area to percolation ponds in the future, this project is impractical and is not feasible.

For a larger scale program, assuming utilization of 30% of the annual effluent flow on alfalfa, the City would need approximately 270 acres for irrigation at current effluent flows, or 530 acres at the design flow of 6.88 mgd. Assuming the cost of farmland near the WWTP is $20,000 an acre, the land purchase would cost the City $5.4 million for 270 acres, or $10.6 million for 530 acres. The costs do not include the pump station or distribution system.

POTENTIAL FOR REGIONALIZATION

6.1 SUMMARY

A conceptual level evaluation of the potential benefits to building a regional wastewater treatment plant to serve Reedley and neighboring communities of Parlier, Cutler-Orosi, and Dinuba, was provided. Due to the length of time that would be needed to develop, build, and implement regional facilities, the concept is evaluated in the context of handling future flows beyond 2030 and to the year 2045.

It is assumed the wastewater treatment facilities would need to treat the wastewater to disinfected tertiary quality, for unrestricted use. Planning level costs are $238 million for construction of the facilities, plus $50 to $90 million for new trunk sewers.

There are also significant issues that would need to be addressed. Key issues involve technical, institutional/financial, and public involvement aspects. About 15 –20 years would be needed for these planning efforts prior to acquiring a site and beginning design.

Due to the significant capital costs, time, effort, and cooperative planning that would be needed; a regional plant is not feasible for near term or long term planning horizons.

6.2 PURPOSE

The purpose of this Chapter is to provide a conceptual level evaluation of the potential benefits to building a regional wastewater treatment plant to serve Reedley and neighboring communities. The neighboring communities are Parlier, Cutler-Orosi, and Dinuba. The concept for the regional wastewater plant would be similar to the Selma-Kingsburg-Fowler County Sanitation District (SKF) wastewater treatment plant that serves those three cities.

This evaluation provides an alternative analysis to the City's objective to continue to expand Reedley's current facilities near the Kings River over the long-term horizon.

6.3 ASSUMPTIONS

Due to the length of time that would be needed to develop, build, and implement regional facilities, it is assumed a regional plant would not be feasible during the current planning period for Reedley (2010 through 2030). Therefore, the concept is evaluated in the context of handling future flows beyond 2030. The planning year 2045 is selected to size future facilities.

Figure 6.1 is a vicinity map showing the location of Reedley, Parlier, Cutler-Orosi, and Dinuba. It is assumed the regional plant would be sited in the general area south of Rose Avenue southwest of Reedley, and north of Highway 201, east of Kingsburg and west of Dinuba. The actual location is not necessary for this level of analysis.

Annual average and peak hour flows (AADF and PHF) from the four cities, for the year 2045, are estimated as follows:

- Reedley: 11 mgd (AADF) and 27 mgd (PHF)
- Parlier: 6 mgd (AADF) and 15 mgd (PHF)
- Dinuba: 11 mgd (AADF) and 27 mgd (PHF)
- Cutler Orosi: 6 mgd (AADF) and 15 mgd (PHF)

Based on the above assumed flows, the regional plant would be sized to treat a total AADF of 34 mgd, and 84 mgd PHF.

6.4 PLANNING LEVEL COSTS

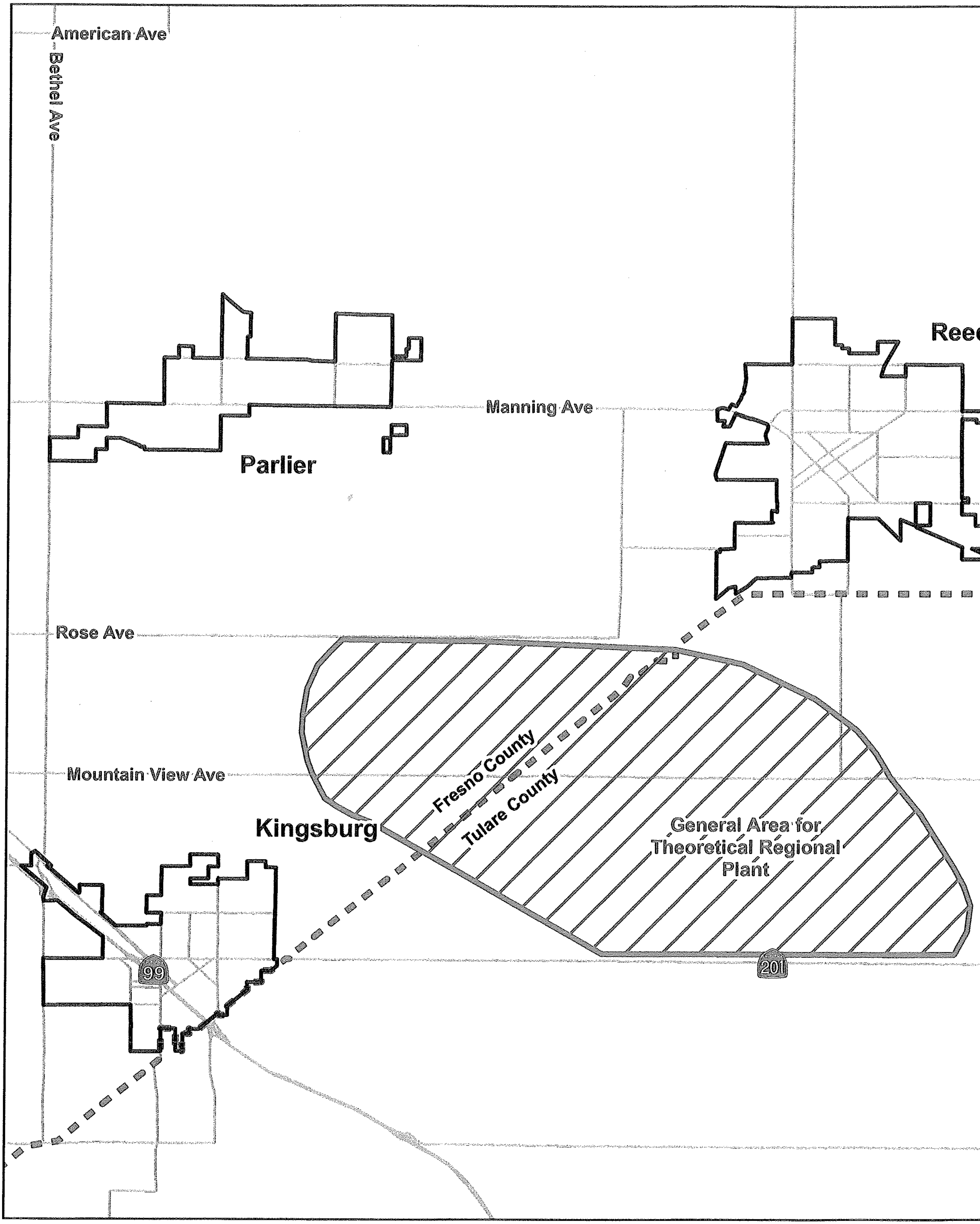
It is assumed the wastewater treatment facilities would need to treat the wastewater to disinfected tertiary quality, for unrestricted use. At a planning level unit cost of $7.00/gpd, capital costs for the regional plant would be roughly $238 million (2005 dollars). This cost does not include the cost for land.

New trunk sewers would need to be built to deliver the wastewater from the four cities to the regional plant. It is estimated that roughly 21 miles of new trunk sewers, sized from 33 inch to 48 inch diameter to handle peak flows, would be required. The estimated cost would be roughly $50 to $90 million (2005 dollars).

Due to the significant capital costs, a regional plant is not feasible for Reedley and the neighboring cities. This is likely to continue to be the case since it is unlikely that large grant programs, such as the Clean Water Act (CWA) grant funds that were available in the 1970s, become available to fund projects. As an example, SKF's facilities were built with CWA grant funding, and local monies were needed to cover only 12.5 percent of the total construction cost.

6.5 REGIONAL PLANT KEY ISSUES

In addition to the costs mentioned above, there are significant issues that would need to be addressed if the cities were to pursue a regional facility. Table 6.1 identifies several key issues and lists them according to technical, institutional/financial, and public involvement aspects. About 15 –20 years would be needed for these planning efforts prior to beginning design.



American Ave
Bethel Ave
Reed
Manning Ave
Parlier
Rose Ave
Mountain View Ave
Fresno County
Tulare County
Kingsburg
General Area for Theoretical Regional Plant
99
201

Table 6.1 Regional Plant Key Issues
Wastewater Treatment Plant Master Plan
City of Reedley

Technical	Institutional/Financial	Public Involvement
Type of BPTC Technology (i.e. affordability vs. reliability)	Permitting/regulatory approvals	Neighborhood acceptance
Background groundwater quality determination	Real property availability and acquisition issues	Political considerations
Siting considerations (soils, groundwater, neighboring land uses, etc.)	Reuse agreement negotiations (i.e. private landowners, irrigation districts, etc.)	Odor/noise/air quality/aesthetic impacts
Solids handling, treatment, beneficial reuse	Cost sharing agreements between cities	Environmental Impact Report
Collection system cost determination	Fresno County/Tulare County jurisdictional agreement	
Confirm reuse market		
Integration and consistency with various regional groundwater management plans		

One key consideration is that a regional plant would transport the water from the four communities to one location for percolation and reuse, affecting the overall water balance of the area. This may be viewed as a disadvantage over the continuation of local treatment plants. Groundwater storage is becoming an increasingly important issue, and is expected to become a greater issue in the next decades. As an example, the City of Clovis is proceeding with plans to build their own 8 mgd wastewater treatment facility to handle some of the city's future flows. One advantage that has been identified for the new Clovis plant is that it will keep the water on the east side of the Fresno/Clovis metropolitan area, rather than have those flows conveyed to the Fresno/Clovis Regional Wastewater Reclamation Facilities (RWRF), southwest of Fresno.

Due to the significant amount of time, effort, and cooperative planning that would be needed, a regional plant is not feasible for near term or long term planning horizons.

EXISTING WASTEWATER TREATMENT FACILITIES

7.1 SUMMARY

There are three separate treatment plants located on a common site. Plant Nos. 1 and 2 have been abandoned. Plant No. 3 is the City of Reedley's current treatment facility. It consists of a headworks with a rotary screen and flow metering, an oxidation ditch, two secondary clarifiers, RAS and WAS pumping, and effluent pumping. All of the facilities are well maintained. However, there are some modifications and improvements that have been identified.

It is recommended that a new headworks facility be constructed due to the age and limited capacity of the existing facility. Because of the need for nitrogen removal, anoxic basins ahead of the oxidation ditch will be required. Because of the length of time the RAS and WAS pumps have been in service, they should be overhauled and reconditioned. This would also include the valves, meters, and other appurtenances. The effluent screw pumps have also been in service for over 20 years. Consideration should be given to replacing these pumps with centrifugal pumps with greater capacity. It is recommended that the underdrain pipe between Percolation Ponds 2 and 3 be severed and plugged similar to the pipe between ponds 1 and 2.

If the City decides to keep the option of discharging to the Kings River, there are some minor items that need to be repaired at the Filtered Effluent Pump Station. These include the refurbishment or replacement of isolation valves and gates. If this disposal option is discontined, as recommended in Chapter 4, the pump station could be demolished. The chlorination and dechlorination equipment should be evaluated due to its age and infrequent use. These facilities could also be demolished if the Kings River discharge option is discontinued.

It is recommended that a new aerated sludge holding tank be installed upstream of the centrifuges. This would allow the operation of the sludge wasting to be separated from the dewatering operation. Consideration should also be given about the remaining life of the centrifuges. As the flow to the plant increases, there will be increased dewatering. This can be handled with longer running times or larger equipment. An investigation should be made as to whether larger centrifuges can fit within the existing building.

Other improvements that are recommended include the non-potable water system, the size of the potable water line to the plant, and expanded laboratory space. A new administration building is also recommended. The fuel tank for the standby generator should be replaced with a double contained tank. A detailed investigation of the plant electrical system should be made.

7.2 BACKGROUND

There are three separate wastewater treatment plants (WWTP's) located on the site. Plant No. 1 includes an imhoff tank with a standard rate trickling filter plant. Plant No. 1 has been out of service since 1970. Plant No. 2 is a trickling filter plant that has a rated capacity of 0.5 million gallons per day (mgd). This plant has been out of service for several years. Plant No. 3 is an oxidation ditch plant that was placed into service in 1982. This plant has a rated capacity of 3.0 mgd and is the only plant currently in service. These three plants are shown in Figure 7.1 on the following page.

7.3 PLANT NO. 1

As previously stated this plant is abandoned and has been out of service since 1970. The plant is located to the east of the oxidation ditch as shown in Figures 7.1 and 7.2. The facilities include imhoff tanks (~80 ft by 40 ft), a rectangular standard rate trickling filter with stationary nozzles (~110 ft by 160 ft), rectangular secondary clarifier (~20 ft by 60 ft), and a covered effluent holding tank (~30 ft by 60 ft). At this time, these facilities are planned to be demolished to make room for future capacity improvements.

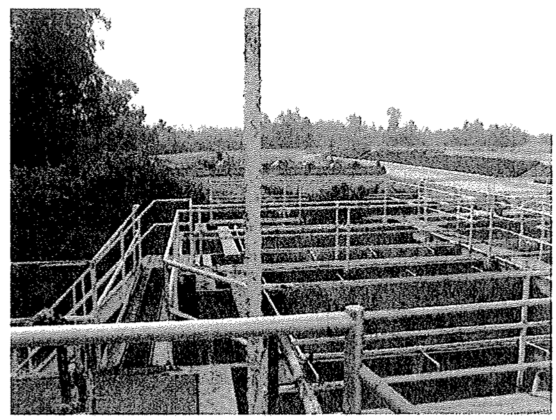
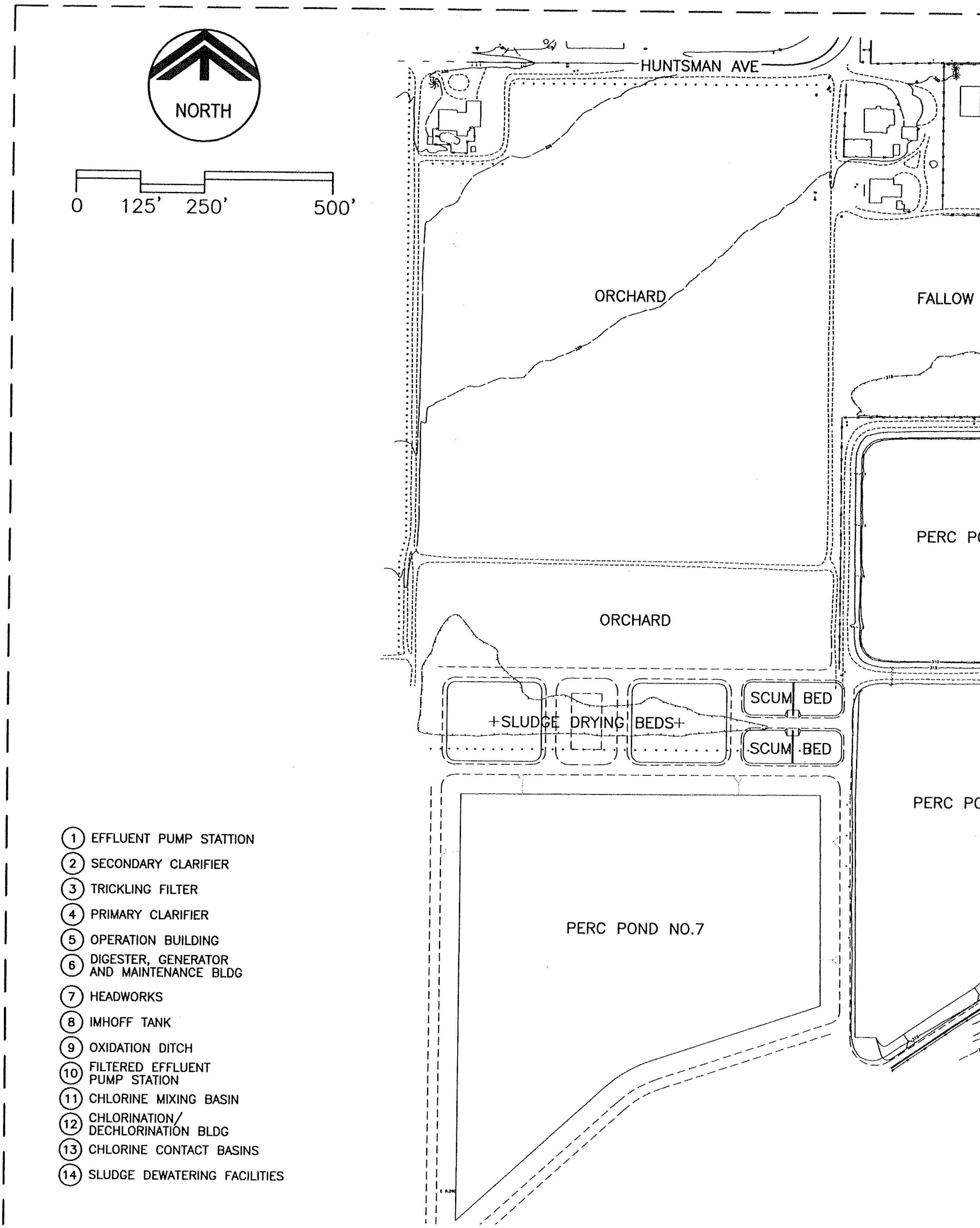


Figure 7.2 Plant 1

7.4 PLANT NO. 2

This plant is comprised of primary treatment, secondary treatment, and anaerobic digestion that have a rated capacity of 0.5 mgd. This plant is abandoned and with the exception of the anaerobic digester has not been operated since 1995. It is unknown when the anaerobic digester was last used. Due to the age of the facilities, their technology, and their limited treatment capacity of 0.5 mgd, it is anticipated that these facilities will eventually be demolished. Due to the length of time that these facilities have been out of service it is unlikely that they can be placed into service without major rehabilitating. These facilities are located on the north side of the site as shown in Figure 7.1.



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7.4.1 Primary Treatment

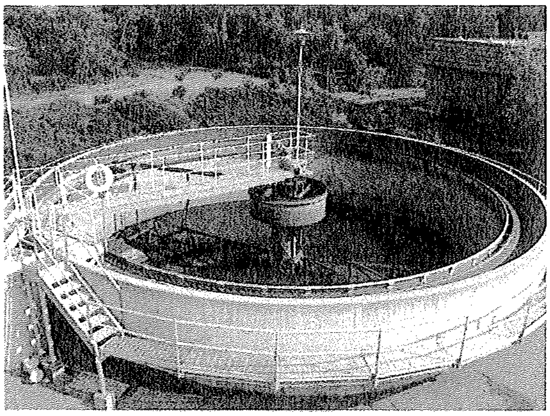


Figure 7.3 Plant 2 Primary Clarifier

The primary treatment consists of a 45-foot diameter primary clarifier with a side water depth of nine feet. The primary sludge had been pumped to Plant No. 3 oxidation ditch for stabilization. The structure and equipment appears to be in relatively good condition as shown in Figure 7.3. However, due to the length of time that the primary clarifier has been out of service it is recommended that the drive be serviced and other mechanical equipment be inspected if it were to be placed backed into service.

7.4.2 Secondary Treatment

7.4.2.1 High Rate Trickling Filter

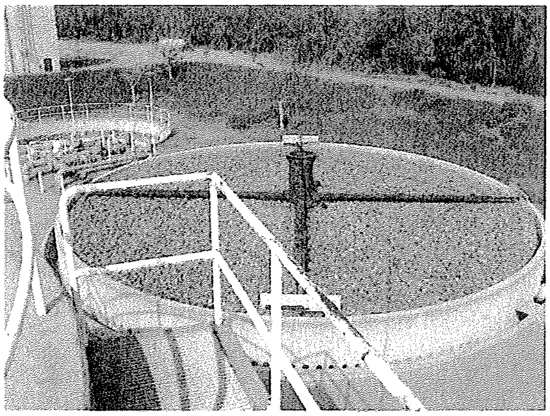


Figure 7.4 Plant 2 Trickling Filter

Following the primary clarifier is a 55-foot diameter high rate trickling filter. The filter is comprised of rock and is 4 feet deep as shown in Figure 7.4. The condition of the rotary distributor is unknown. However, based on the operating history of similar equipment at other treatment plants it is very likely that it will have to be replaced or completely overhauled prior to the trickling filter being used in the future.

7.4.2.2 Secondary Clarifier

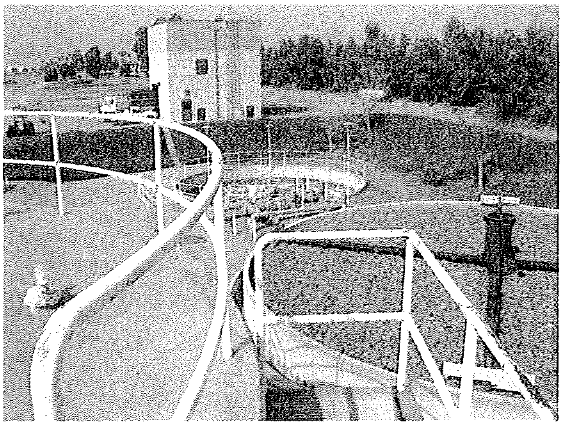


Figure 7.5 Plant 2 Secondary Clarifier

Hydraulically downstream from the trickling filter is the secondary clarifier. The clarifier is 35 feet in diameter with a sidewater depth of 8 feet. The settled sludge is pumped to the primary clarifier where it is co-settled with the primary sludge. As with the other components of Plant No. 2 this clarifier has not been in service for many years. The structure and equipment appear to be in relatively good condition as shown in Figure 7.5. However, due to the length of time that the secondary clarifier has been out of service, it is recommended that the drive be serviced and other mechanical equipment be inspected if it were to be placed back into service.

7.4.3 Anaerobic Digestion

Plant No. 2 has one anaerobic digester as shown in Figure 7.6. This digester has been out of service for at least 20 years. The sludge heating and mixing equipment that was located in the building adjacent to the digester have been removed and the space has been converted into storage. Based on discussions with plant personnel it is unclear if the digester was drained and cleaned prior to being abandoned. With the absence of heating and mixing equipment and the uncertain condition of the interior of the digester, it would require extensive rehabilitation to be used in the future as an anaerobic digester.

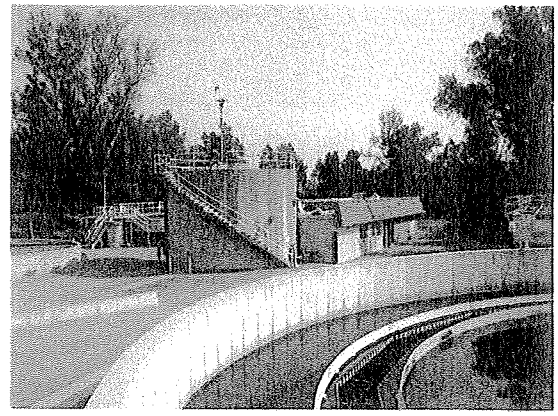


Figure 7.6 Plant 2 Anaerobic Digester

7.4.4 Sludge Pumping

Since the anaerobic digester is not in operating condition, the combined primary and secondary sludge, along with the collected scum was pumped to the oxidation ditch. Operating in this mode may only provide a limited benefit since the sludge and its associated loading that is removed in the primary clarifier is placed into the oxidation ditch. This sludge loading is actually using capacity that could be used for additional influent wastewater.

7.5 PLANT NO. 3

7.5.1 Preliminary Treatment (Headworks)

The preliminary treatment consists of screening and flow metering. The headworks structure is not enclosed and is located adjacent to the Plant No. 1 Imhoff tanks. The headworks was originally constructed in the 1950's, and has been modified several times since.

7.5.1.1 Sources of Wastewater and Sampling

The structure receives flow from two primary sources, a 12-inch force main from the Reed Avenue Pump Station and a 21-inch Olsen Avenue Bridge Siphon. There are however, several other smaller flows that enter the structure through force mains from a mobile home park and a residential development as

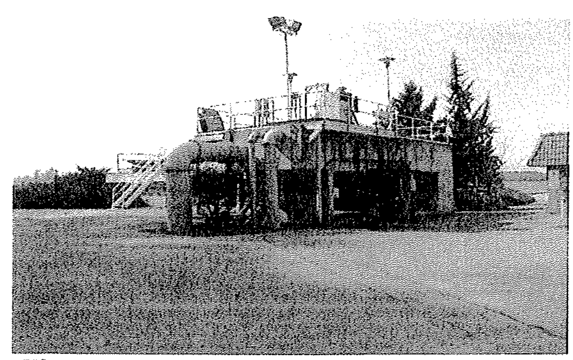


Figure 7.7 Headworks

shown in Figure 7.7. These sources are all combined prior to the screening process. The hydraulic capacity of the headworks is very limited. To prevent overflows, the City has installed a liquid level detector just upstream from the screen. In the even of high liquid level prior to the screen, an alarm is initiated. A composite influent sampler is located in this location. The sampler collects combined influent samples paced with the influent flow rates.

7.5.1.2 Screening

The screening is accomplished with a rotary type screen manufactured by Westech as shown in Figure 7.8. The rated capacity of this screen is 4.2 mgd. With the exception of frequently replacing the nylon brushes, the screen has a good operating history. The removed materials are conveyed up through the rotary screen where it is washed with spray water. This spray water is utilized to break up and minimize the organics in the removed screenings. The removed screenings are then deposited into a dumpster for disposal by landfilling. The screening equipment is operated automatically using two different control features. The primary control function is water level in the channel, where the screen starts a run cycle after a predetermined level has been reached. The secondary control feature is based on time.

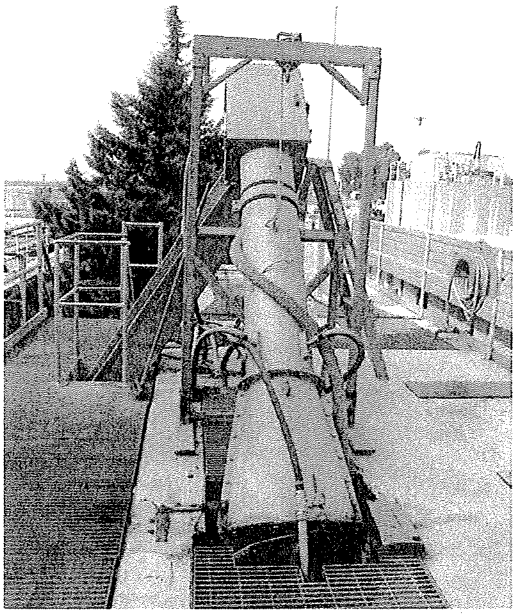


Figure 7.8 Rotary Screen

As a backup to the rotary screen a manually cleaned bar rack is located in a bypass channel. This channel can be used in high flow events, or when the rotary screen is taken off line for maintenance or repairs. Any trash removed from this screen is manually placed into the dumpster for disposal.

7.5.1.3 Flow Metering

Following the screen the influent is metered using two Parshall flumes as shown in Figure 7.9. One flume measures the flow to Plant No. 3 while the other flume measures the flows to Plant No. 2. The liquid level of the influent is measured using ultrasonic level detectors. The flumes have 12-inch throats with an estimated capacity of 9 mgd. Generally, it is recommended a straight length of channel that is 10 to 20 times the throat width be provided upstream of the flume. This approach channel allows the wastewater flow to become more laminar which will result in greater flow

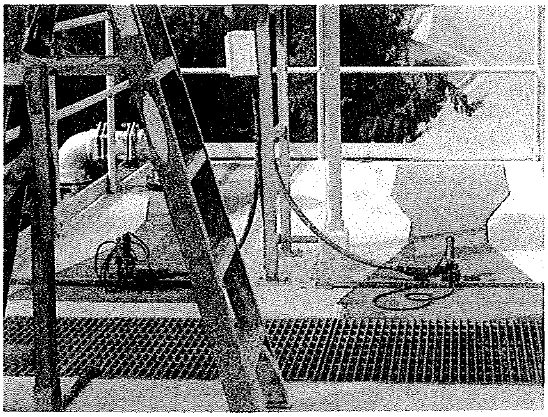


Figure 7.9 Influent Flow Meters

metering accuracy. For the existing headworks, this would result in a straight approach section downstream from the isolation flow gates of 90 to 180 inches (7.5 to 15 ft). The existing headworks does not provide this feature.

7.5.1.4 Preliminary Treatment Recommendations

Due to the age, hydraulic limitations, size, and configuration of the existing headworks, it is recommended that a new headworks be constructed as part of the future expansion.

7.5.2 Biological Treatment (Oxidation Ditch)

7.5.2.1 Existing Conditions

Biological treatment is accomplished by a "race-track" shaped oxidation ditch as shown in Figure 7.10. The screened wastewater flows by gravity into the basin where aeration and mixing are provided to promote biological treatment of the wastewater. The oxidation ditch is approximately 400 ft. in length with a bottom width of approximately 30 ft. The side slopes are constructed of concrete with a 1:1 slope. Six rotors, each 18 ft in length are placed across the ditch at three locations to provide the mixing and aeration. The capacity of the process is based on both hydraulic and organic detention time.

Figure 7.10 Aeration Rotors

In 1994 the oxidation ditch was modified to increase its treatment capacity. These modifications included raising the water surface by nine inches and the aeration rotors by seven inches. These improvements increased the volume of the ditch from 2.15 mg to 2.4 mg. This increase in volume increased the treatment capacity from 2.27 mgd to 3 mgd. On the downside, raising the water level has caused instances where the mixed liquor splashes over the top of the walls, particularly at the curved ends of the oxidation ditch. The City has installed sheet metal shields to minimize the splashing. A more permanent solution should be installed in the future. The estimated capacity of the oxidation ditch is 3 mgd based on the design criteria and loadings outlined in the Table 7.1 below.

Table 7.1 Plant No. 3 Oxidation Ditch Wastewater Treatment Plant Master Plan City of Reedley	
Parameter	**Value**
Influent flow	3 mgd
Influent BOD_5	190 mg/L
Volume	2.4 MG
BOD_5 Loading	4750 lbs/day
MLSS concentration	3000 - 5000 mg/L
Solids Retention time	23 - 50 days

7.5.2.2 Biological Treatment Recommendations

The existing oxidation ditch has an estimated capacity of 3 mgd based on an influent BOD_5 of 190 mg/L. When new biological treatment units are placed on line it is recommended that the oxidation ditch be taken off line and dewatered. At this time the ditch should be cleaned, and its structural integrity determined, and repairs designed and constructed.

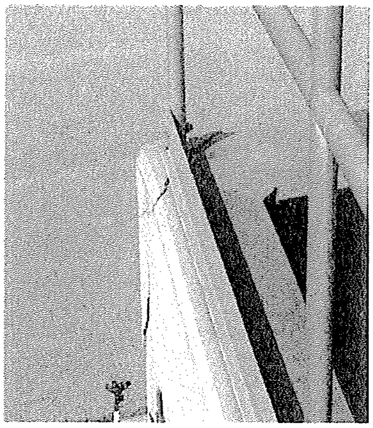


Figure 7.11 Spalling Concrete

The rotors have been in service since 1982. The gearboxes, drives, and bearings have reached or are nearing their estimated useful life. It is recommended that after new treatment facilities have been placed on line, that the oxidation ditch be taken off line and its condition assessed. During this time the gear boxes, drives, bearing, and possibly aeration brushes should be refurbished or replaced. Additionally, there are areas where the concrete is spalling and cracking as shown in Figure 7.11. These areas should also be repaired when the ditch is taken off line.

Because of the need for nitrogen removal, an anoxic basin would be added to this oxidation ditch. The anoxic basin would be sized to maintain the current 3.0 mgd rated capacity of the oxidation ditch.

7.5.3 Secondary Clarifiers

7.5.3.1 Existing Conditions

Hydraulically downstream from the oxidation ditch are two secondary clarifiers. Each clarifier is 68 ft. in diameter with a side water depth of 12 feet as shown in Figure 7.12. The mixed liquor from the oxidation ditch flows through 24-inch pipe into the center feed well of each clarifier. The clarified effluent flows over inboard weirs and launders to the Effluent Pump Station. Each clarifier incorporates two methods for the removal of the sludge that has settled in the secondary clarifier. The first method is through a 12-inch pipe that transports the sludge collected using sludge drawoff tubes. This sludge removal option is not being used. The sludge withdrawal tubes may have been removed from one, if not both, of the clarifiers. The second method is to remove the sludge from the bottom sludge drawoff pit located in the middle of each clarifier. The estimated capacity and design parameters of the clarifiers is outlined in the Table 7.2 below.

In the event that one clarifier is out of service, the remaining online clarifier would be at or above its hydraulic and solids loading capacity. To plan for an event that one of the two existing clarifiers is taken off line between now and when a new clarifier is on line, the City has finalized a Clarifier Emergency Response Plan. This plan outlines the steps needed to operate the WWTP with only one secondary clarifier.

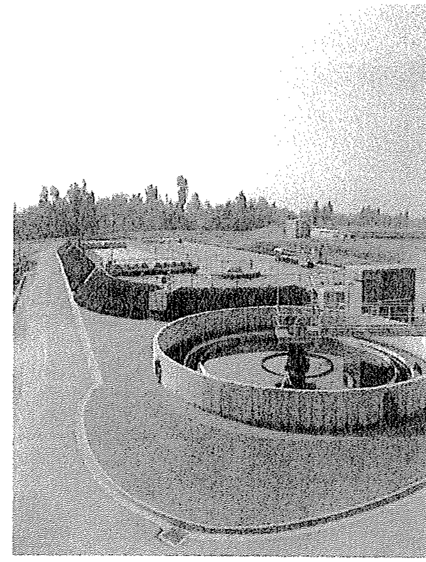


Figure 7.12 Secondary Clarifier

7.5.3.2 Secondary Clarifier Recommendations

The existing clarifiers have been taken off line one at a time, drained, cleaned and their condition assessed. The structures appear to be in good condition. Improvements during the proposed expansion project may include the replacement or rehabilitation of the clarifier's mechanism including the sludge removal mechanism. These improvements will extend the useful life of the clarifiers and provide reliability and redundancy.

Table 7.2 Plant No. 3 Secondary Clarifiers
Wastewater Treatment Plant Master Plan
City of Reedley

Parameter	Value
Average Daily Flow (ADF), each	1.5 mgd
MLSS concentration	3000 - 5000 mg/L
Diameter, each (ft)	68 ft
Sidewater Depth (ft)	12 ft
Overflow rate (gpd/ft^2)	412 gpd/ft^2
Solids Loading, at ADF	10 - 17 lbs/ft^2/day
Detention time at ADF	5.6 hours

The clarifiers incorporate inboard weirs and launders. This configuration makes it difficult for the maintenance staff to clean the weirs and control the growth of algae. Some sections of the weirs appeared to not be level. Future considerations should include provisions to chlorinate and allow easy access to periodically clean the weirs and launders. This may include the removal of the inboard weirs and baffles and the construction of outboard weirs and launders which include density current baffles. When these improvements are being constructed the weirs should be checked and leveled if needed.

7.5.4 RAS/WAS Pump Station

The RAS/WAS pump station includes RAS pumping, WAS pumping, scum pumping and associated facilities. A schematic of this pump station is shown in Figure 7.13.

7.5.4.1 RAS Pumping

The RAS from the bottom of each clarifier enters the RAS Pump Station wetwell through one of two 12-inch pipes as discussed in Section 7.4.3 above. These pipes are outfitted with 12-inch electrical modulated control valves and magnetic meters. The electric modulated control valves on the piping that is connected to the sludge withdrawal tubes are in need of repair. One does not function at all, and the electric actuator on the other has been used for parts on other valves.

Figure 7.14 RAS Wetwell

Likewise, the pipelines from the center sludge collection pit of each clarifier also incorporates electrically modulated control valves and magnetic flow meters which appeared to be functioning during our site visits. The RAS removal rate is controlled using the RAS magnetic flow meters, the electric control valves, and the VFD drives on the pumps. The RAS removed from the bottom of the clarifiers flows through the 12-inch withdrawal piping into the RAS wetwell located on the north side of the RAS/WAS pump station as shown in Figure 7.14. The RAS pumps then pump the RAS from the wetwell back to the oxidation ditch. Three RAS pumps are installed to do this service as shown in Figure 7.15 and as outlined in Table 7.3. The RAS pumps incorporate variable speed drives which allow each pump to deliver between 650 and 1,220 gallons per minute (gpm). These pumps are adequate for the two existing clarifiers and single oxidation ditch. Additional RAS pumps will be required when additional biological treatment capacity is constructed in the future.

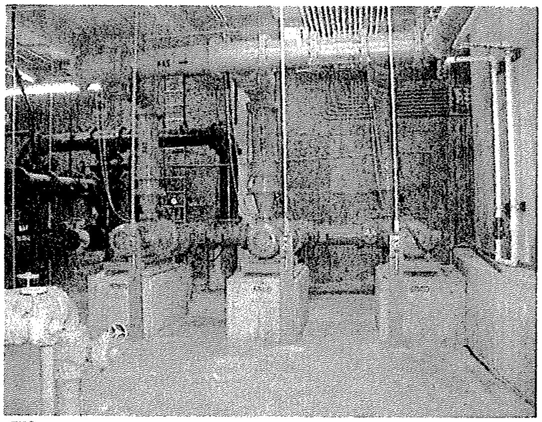
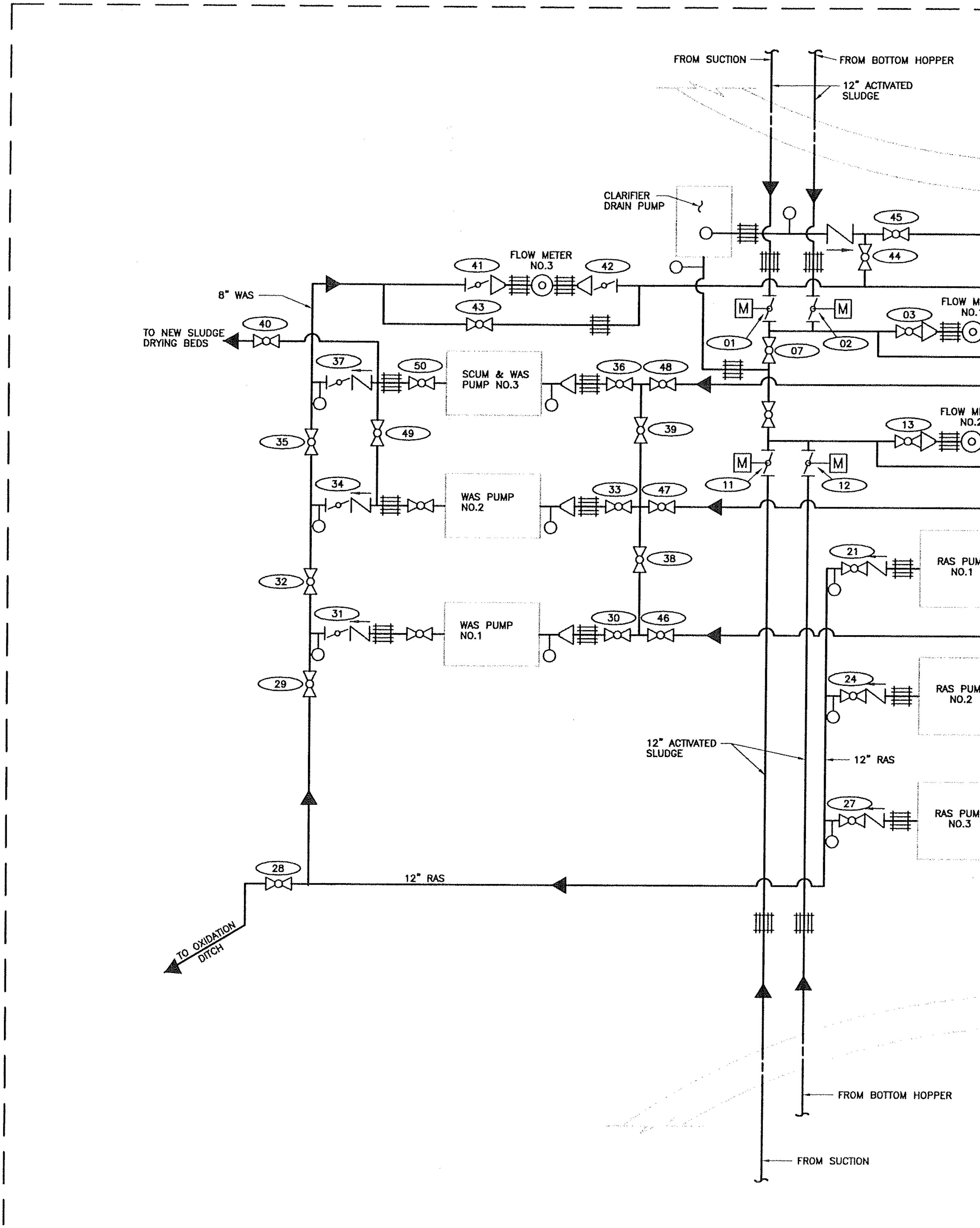


Figure 7.15 RAS Pumps



FROM SUCTION
FROM BOTTOM HOPPER
12" ACTIVATED SLUDGE
CLARIFIER DRAIN PUMP
45
44
41
FLOW METER NO.3
42
8" WAS
43
FLOW M NO.1
03
TO NEW SLUDGE DRYING BEDS
40
01
07
02
37
50
SCUM & WAS PUMP NO.3
36
48
35
49
39
FLOW M NO.2
13
11
12
34
WAS PUMP NO.2
33
47
38
21
RAS PUM NO.1
32
31
WAS PUMP NO.1
30
46
29
24
RAS PUM NO.2
12" ACTIVATED SLUDGE
12" RAS
27
RAS PUM NO.3
28
12" RAS
TO OXIDATION DITCH
FROM BOTTOM HOPPER
FROM SUCTION

Table 7.3	Plant No. 3 RAS Pumps Wastewater Treatment Plant Master Plan City of Reedley
Parameter	**Value**
Number of pumps	3
Type	Centrifugal
Capacity, each	650 - 1,220 gpm
Horsepower, each	15 HP
Drives	VFD

7.5.4.2 WAS Pumps

To maintain the proper mixed liquor concentration, sludge must be wasted from the system. This is accomplished using WAS pumps as shown in Figure 7.16. These pumps transfer WAS from the RAS wetwell to the sludge dewatering facilities that are discussed in Section 7.4.6. There are two progressive cavity WAS pumps (WAS Pump 2 and 3) installed in 1996 as part of the sludge dewatering project, and one standby centrifugal pump (WAS Pump No. 1) that was installed in the 1980's, and as further described in Table 7.4. The progressive cavity pumps have a rated capacity of 100 gpm, but actual operate near 120 gpm. The pumps are used to pump the WAS to the centrifuges discussed in Section 7.4.9. According to plant staff the centrifugal pump has not been used for several years.

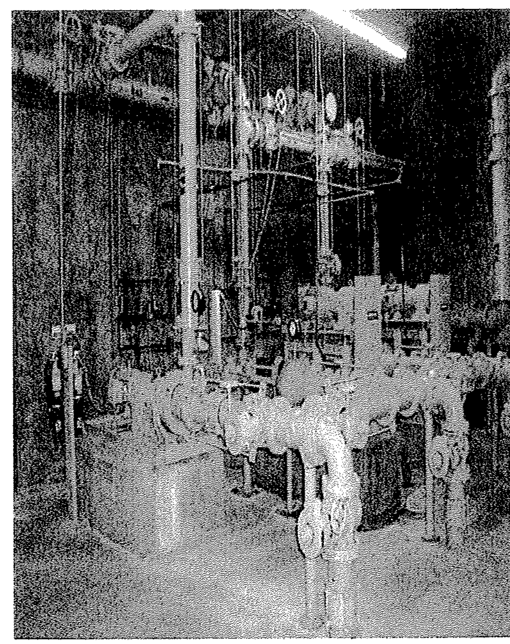


Figure 7.16 WAS Pumps

Table 7.4	Plant No. 3 WAS/Scum Pumps Wastewater Treatment Plant Master Plan City of Reedley
Parameter	**Value**
WAS Pump No. 1	
Type	Centrifugal
Capacity	150 gpm
Horsepower	3 HP
WAS Pump Nos. 2 and 3	
Type	Progressive Cavity
Capacity	
Horsepower	7.5 HP

7.5.4.3 Scum Pumping

Scum that is removed from the surface of the secondary clarifiers flows by gravity to the scum wetwell located on the north side of the RAS/WAS pump station. When the scum level reaches a high level the scum pump starts and pumps the scum to the scum drying beds discussed in Section 7.4.11. The pump that performs this function is WAS Pump No. 3, which was discussed in Section 7.4.4.2.

7.5.4.4 Clarifier Drain Pump

A self priming Gorman Rupp pump is used in the event that a clarifier needs to be drained as shown in Figure 7.17. The suction side of this pump is manifolded into the sludge drawoff piping from the two secondary clarifiers. The discharge piping is routed to the RAS wetwell. According to Plant staff this system is seldom used and operates satisfactorily when needed.

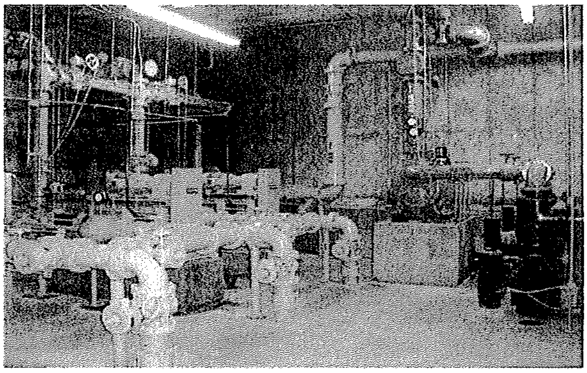


Figure 7.17 Clarifier Drain Pump

7.5.4.5 Sump Pump

There is a sump pump in the RAS/WAS pump station. The sump pump pumps floor drainage and other nuisance flows back to the clarifier drain pump discharge pipe, which in turn flows to the RAS/WAS wetwell. There has been an instance where the check valve on the sump pump discharge failed in the open position. When the clarifier drain pump was then started, mixed liquor from the clarifier flowed backwards through the sump pump discharge pipe and flooded the sump pump facility. The operations staff has remedied this problem by replacing the sump pump discharge check valves.

7.5.4.6 RAS/WAS Pump Station Recommendations

As part of a future project, probably when the existing clarifiers are taken off line for rehabilitating, the existing RAS pumps, valves and controls should be evaluated and reconditioned or replaced as needed. This may include but is not limited to overhauling the RAS pumps, fixing or replacing valves and meters, and removing piping and equipment that is not planned to be used.

Centrifugal pumps are generally not used for centrifuge sludge feed service. Replacing this pump with a progressive cavity pump should be considered. This would provide reliability and redundancy to this operation, and as discussed in Section 7.4.4.3 it would allow a dedicated a progressive cavity pump for scum pumping. As part of this project, the piping, valves, and flow meters should be evaluated and modifications made to provide reliability and redundancy while eliminating features that are not needed.

As discussed above it is recommended that the centrifugal WAS pump be replaced with a progressive cavity pump. This would allow the WAS Pump No. 3 to be dedicated for scum duty while providing two WAS pumps.

7.5.5 Effluent Pump Station

7.5.5.1 Existing Conditions

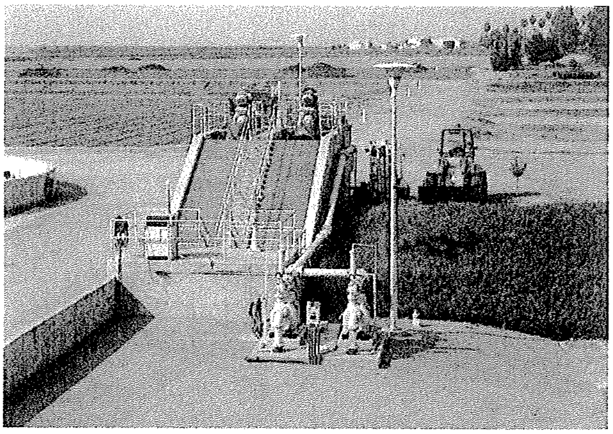


Figure 7.18 Effluent Screw Pumps

The clarified liquid that passes over the secondary clarifier weirs flows by gravity through 24-inch piping to the effluent pump station influent wet well. The pump station utilizes two screw pumps as shown in Figure 7.18. Each screw pump is 42-inch in diameter and incorporates a two flight screw as summarized in Table 7.5. The screw pumps discharge the effluent to a distribution box located on the top of the Effluent Pump Station structure where it flows by gravity to the percolation ponds.

Table 7.5	Effluent Pumps Wastewater Treatment Plant Master Plan City of Reedley
Parameter	**Value**
Number of Pumps	2
Type of Pumps	Twin Flight Screw Pumps
Capacity, Each	5.3 mgd
Lift	12.3 ft
Horsepower, each	25 HP

7.5.5.2 Effluent Pump Station Recommendations

The pumps have been in service for over 20 years. Although they are maintained and kept in good condition by City staff the drives and mechanical equipment has reached their useful life. Additionally, without adding additional pumping capacity the two screw pumps do not appear to be capable of meeting future maximum design flows.

There are several areas on the structure where the concrete has deteriorated and is cracking and spalling as shown in Figure 7.19. If the Effluent Pump Station is kept in service the condition of the concrete should be determined and repairs designed and implemented.

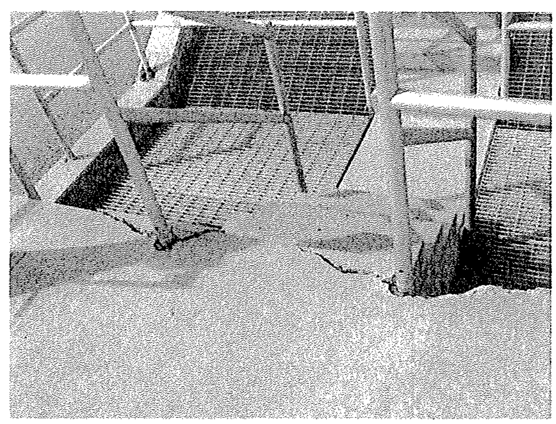


Figure 7.19 Concrete Cracking

It is recommended that these pumps be replaced with centrifugal pumps as part of a future project. The structure would then be abandoned in place, and could be demolished with future capacity enhancements.

7.5.6 Percolation Ponds

7.5.6.1 Existing Conditions

Following the effluent pump station are seven percolation ponds as shown in Figure 7.20. These ponds have an approximate combined surface area of 33.13 acres as summarized in Table 7.6. The percolation capacity of these ponds is discussed in Chapter 5 of this report. The pond dikes are generally constructed with a 3:1 slope with a minimum of 15 feet wide top width. Maximum water depth is limited to 5 feet with 2 feet of freeboard. There are several distribution pipelines which carry the effluent to the percolation ponds. From the distribution lines there are 12-inch diameter feed lines equipped with plug valves that control the effluent flow into the individual percolation ponds. The plug valves are located in valve vaults. At the terminus of these 12-inch feed lines are concrete aprons and dissipaters on the embankments to minimize erosion. As with all percolation ponds the

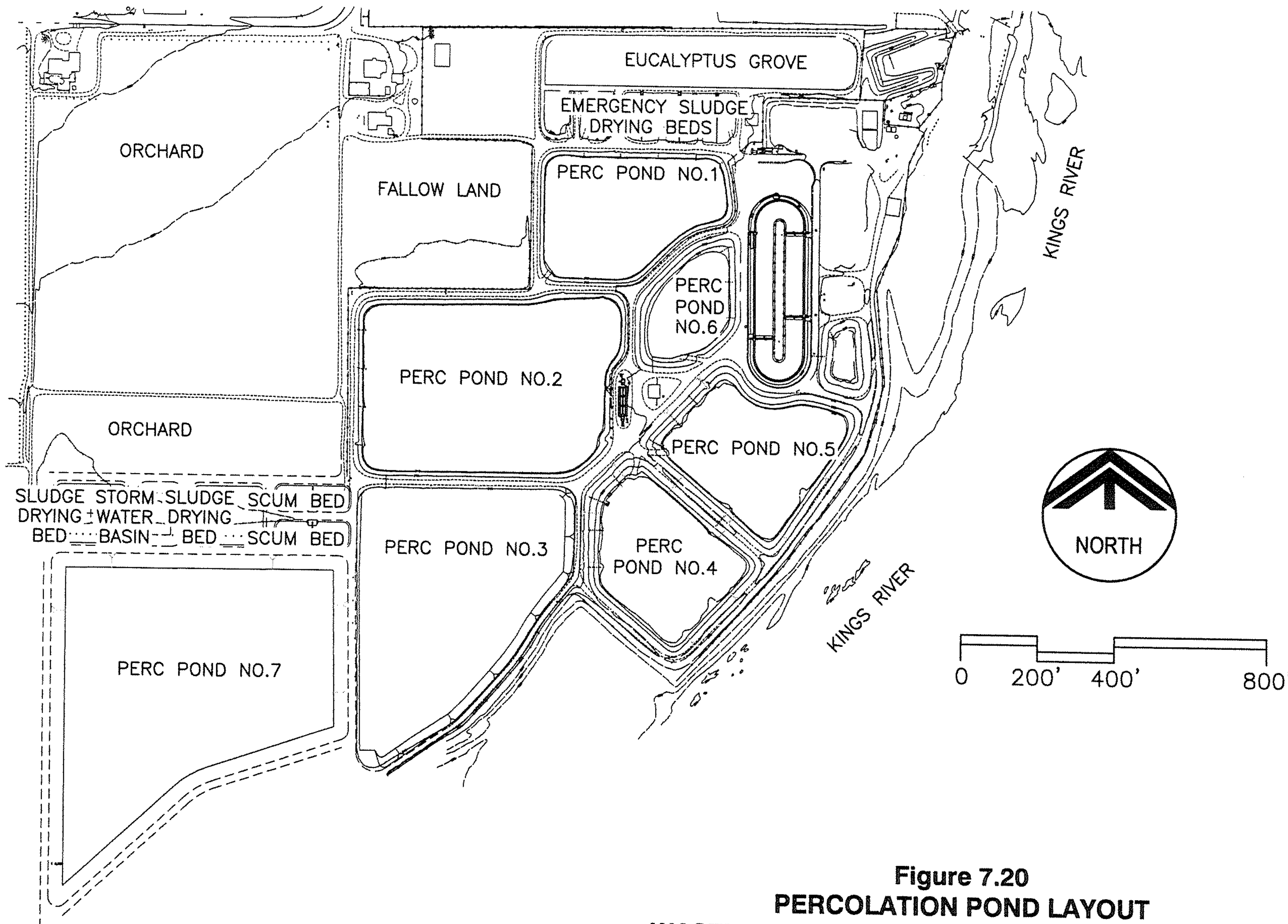


Figure 7.20
PERCOLATION POND LAYOUT
WASTEWATER TREATMENT PLANT MASTER PLAN
CITY OF REEDLEY

carollo engineers

actual capacity varies. Not only from pond to pond but based on other factors such as the time of year, the water elevation in the Kings River, the ground water elevation under the ponds, and others.

Table 7.6 Percolation Ponds
Wastewater Treatment Plant Master Plan
City of Reedley

Pond Number.	Area (ac)
Pond No. 1	2.74
Pond No. 2	6.79
Pond No. 3	6.30
Pond No. 4	2.58
Pond No. 5	2.47
Pond No. 6	0.95
Pond No. 7	11.30
Total Area	**33.13**

The City currently directs all of the effluent to the one or two ponds at a time. Depending on the ponds' percolation characteristics, the length of time that each pond is receiving effluent varies. Every two or three months, regardless of how well the online pond is percolating effluent, the City isolates the pond and allows it to dry. When the pond is dry the City deep rips and discs the pond to prepare it for service.

To protect the Kings River from accidental overflow of the percolation ponds, the two ponds nearest the river, Ponds 4 and 5, have been interconnected. The overflow consists of one interconnecting pipe at elevation 5 feet above the pond floors.

7.5.6.2 <u>Percolation Pond Recommendations</u>

Under Percolation Ponds Nos. 1, 2, and 3 is an underdrain system. This system consists of parallel grid system of 8-inch diameter perforated pipe. The underdrains from each pond drain to a common drawoff location. The underdrain system was installed to collect and recover treated effluent applied in excess of the silt's layer percolative and absorptive capacity. During periods of heavy flows, the system was to provide increased disposal capacity, as well as a natural filtration mechanism to further increase the effluent quality. The percolated effluent would then flow by gravity to the Filtered Effluent Pump Station for pumping to the Chlorination/Dechlorination facility prior to discharge to the Kings River.

The underdrain system did not perform as well as planned, and has not been operational for several years. To prevent percolate water from back flowing between ponds, the City has severed the common manifold piping between Ponds 1 and 2. This was accomplished by exposing the common header piping and removing a section of pipe. The ends were then plugged and encased in concrete. To prevent the back flowing between Ponds 2 and 3 it is recommended that the common manifold piping between the ponds be severed and plugged.

7.5.7 Filtered Effluent Pump Station

7.5.7.1 Existing Conditions

The Filtered Effluent Pump Station, as shown in Figure 7.21, was designed to pump filtered water that percolates from Ponds 1, 2, and 3, and by gravity from the effluent pump station. These flows enter the wetwell and are then pumped by the filtered effluent pumps to the chlorination process. This pump station is only used intermittently when the City discharges to the Kings River.

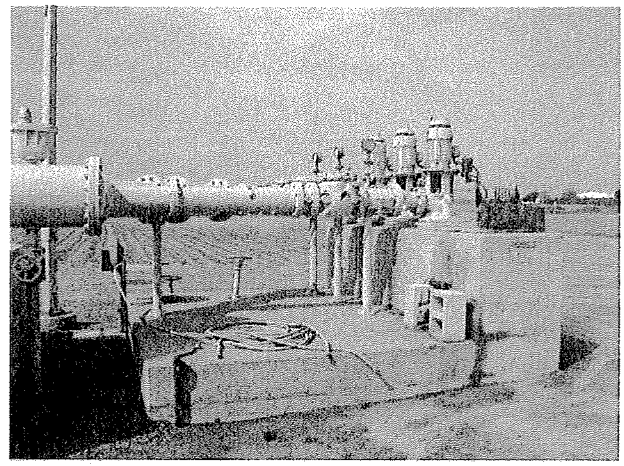


Figure 7.21 Filtered Effluent Pumps

Located in Pond No. 2 is a concrete drawoff structure as shown in Figure 7.22 which was installed as part of the underdrain piping system in Pond No's. 1, 2, and 3. It is currently used to direct the water from Pond No. 2 into the Filtered Effluent Pump Station. The slide gates on this structure appear to leak. On the pipe line between the drawoff structure and the Filtered Effluent Pump Station is a buried isolation valve. This valve is reported to be inoperable and is froze in the open position. This condition allows effluent from Pond No. 2 to flow through the Filtered Effluent Pump Station Wetwell and by gravity to Ponds 4 and 5.

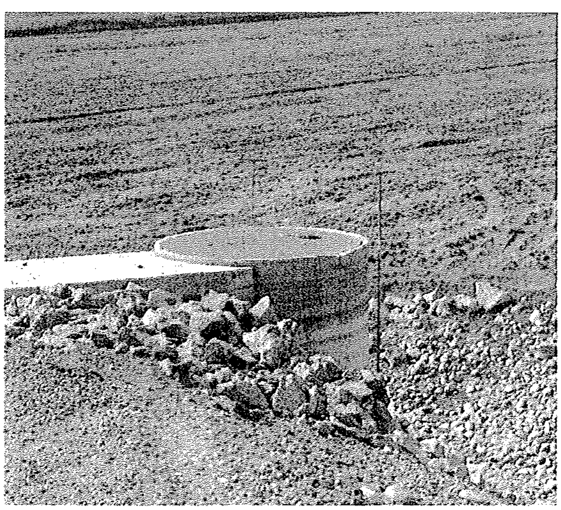


Figure 7.22 Pond No. 2 Drawoff Structure

7.5.7.2 Filtered Pump Station Recommendations

If the City elects to continue to keep the Kings River discharge option open, it is recommended the Filter Pump Station be kept in good operating condition. In this scenario the slide gates and buried valve should be replaced or repaired. If the City elects not to discharge to the Kings River and has this option removed from their discharge permit, this structure could be demolished.

7.5.8 Chlorination/Dechlorination

The chlorination/dechlorination facilities are only used in the event that the City discharges to the Kings River. This method of disposal is seldom used, and the continued maintenance of these facilities needs to be carefully evaluated. These facilities could be demolished also if the City discontinues the permit option to discharge to the Kings River.

7.5.8.1 Rapid Mix Basin

Following the filtered effluent pump station is the rapid mix chamber. It is in this location where the chlorine solution is introduced and thoroughly mixed with the effluent. The mixing is accomplished using a vertical mixer as shown in Figure 7.23. Due to the limited times that the effluent is discharged to the Kings River this mixer is seldom used. Even with the limited amount of use the mixer has been well maintained.

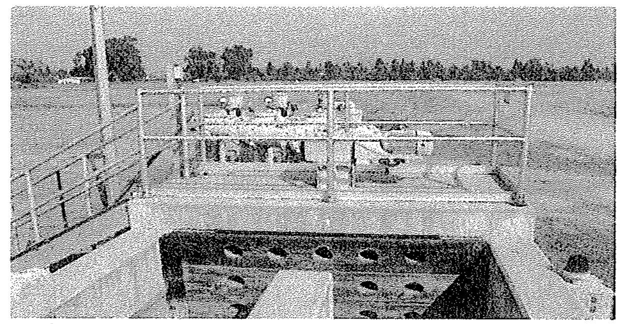


Figure 7.23 Rapid Mix Chamber

7.5.8.2 Chlorine Contact Basin

The chlorinated effluent flows by gravity from the rapid mix basin to the chlorine contact chamber. The chlorine contact chamber consists of two serpentine channels, each 75 feet long, 9 foot deep, and 4 feet wide. This results in a volume of 20,200 gallons each. The chlorine contact basin provides the detention time for the chlorine to contact with and disinfect the effluent. The detention time varies based on the flow through the chamber as shown in Figure 7.24 on the following page. The actual capacity of a chlorine contact basin is generally based on a CT Value. Where "C" is the chlorine dose in mg/L and "T" is the detention time in minutes. A common CT value used for secondary effluent would be between 450 and 600. Based on a CT of 450, and a minimum of 15 minutes detention time, a maximum chlorine dose of 30 mg/L, the chlorine contact basin would have a maximum capacity of approximately 4 mgd with both basins in service. This capacity exceeds the permitted flow limit for discharge to the Kings River, which is 1.75 mgd.

Prior to discharge, the chlorinated effluent is de-chlorinated using sulfur dioxide. This reaction is instantaneous and additional contact time is not

Figure 7.25 River Discharge Meter

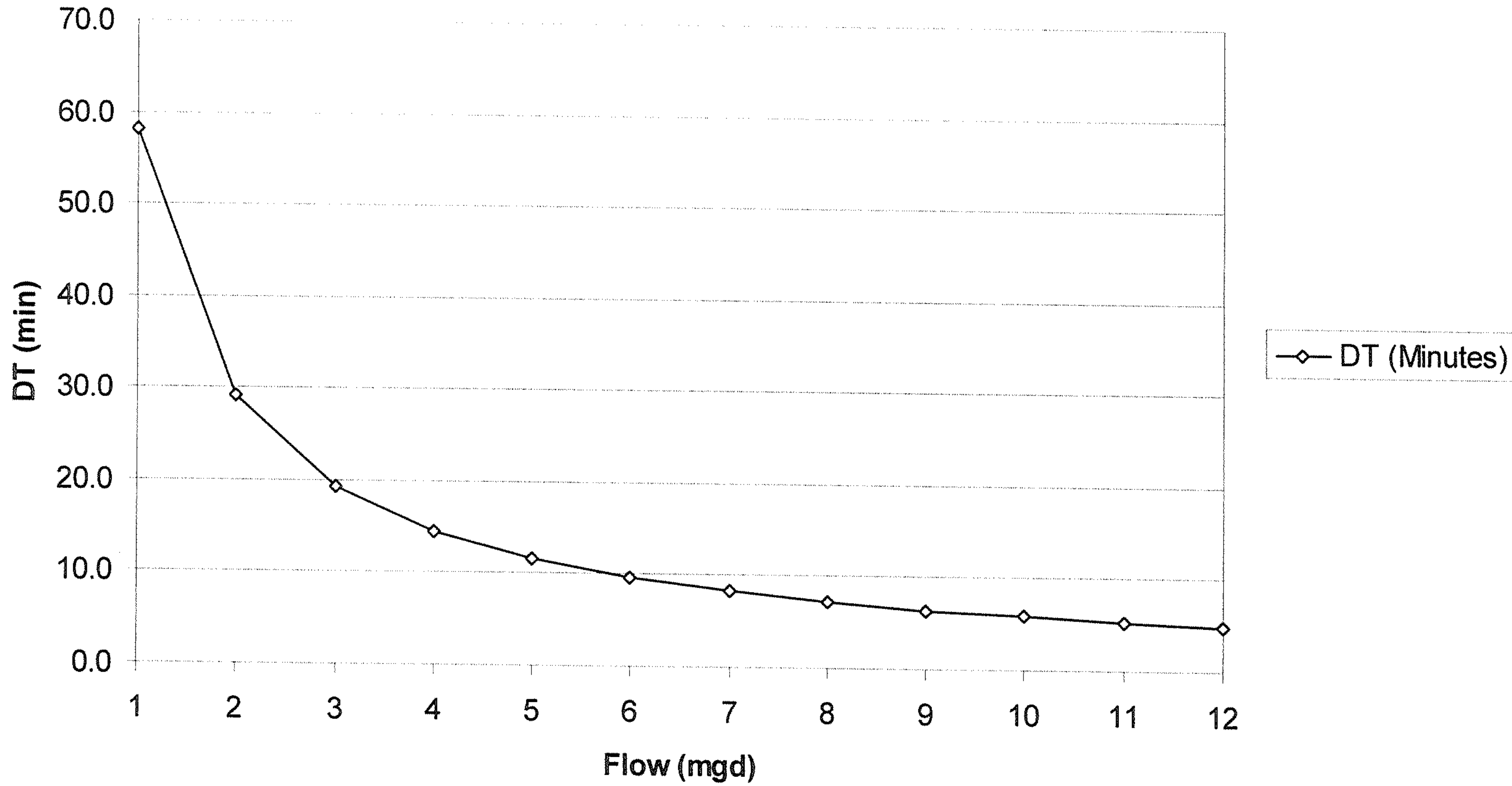


Figure 7.24
CL2 BASIN DETENTION TIME VS FLOW
WASTEWATER TREATMENT PLANT MASTER PLAN
CITY OF REEDLEY

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provided. The de-chlorinated effluent is then metered using a Parshall flume prior to discharge to the Kings River as shown in Figure 7.25.

7.5.8.3 Chlorination Building

The chlorine gas and sulfur dioxide storage and feed equipment is located in this building. The building is divided into three distinct area, the chlorine storage area, the sulfur dioxide storage area, and the chemical feed room. Both the chlorine (Cl_2) and sulfur dioxide (SO_2) are delivered by truck in one ton steel cylinders. The cylinders are unloaded using an overhead crane and stored in separate rooms as shown in Figures 7.26 and 7.27.

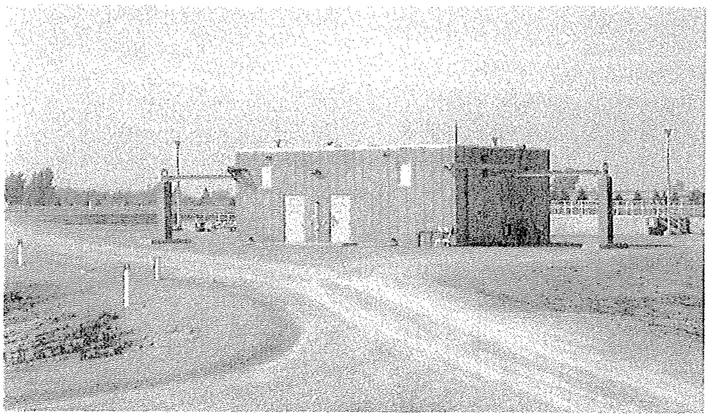


Figure 7.26 Chlorine Building

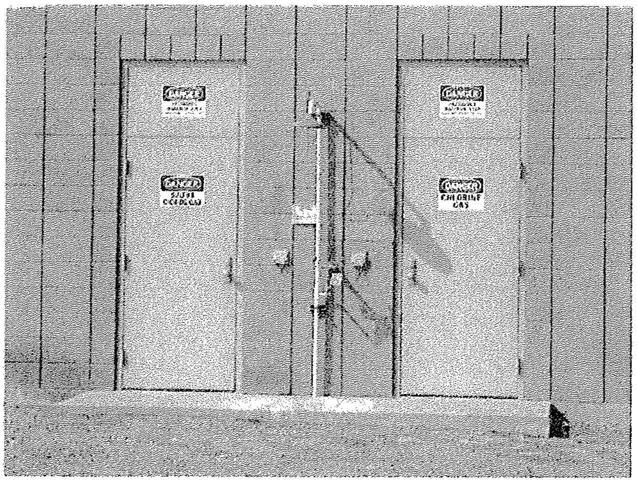


Figure 7.27 Chemical Storage Areas

The chemical feed room houses the 2 chlorinators and 2 sulfonaters. The chlorinators have a capacity of 500 lbs/day while the sulfonaters have a capacity of 250 lbs/day. The equipment was not in use during our site visits since the City was not discharging to the Kings River. Based on discussions with plant staff only one of the chlorinators is functional. The operating condition of the sulfonaters is unknown. Other features of the chlorination and de-chlorination systems should be thoroughly evaluated before the system is expanded or used on a more frequent basis. These components include the chlorinators, sulfonaters, piping, valves, and other appurtenances.

Originally the chlorinators and sulfonaters used plant water (secondary effluent) for the transport of the chemicals to their respective locations in the contact chamber. However, due to plugging and other operational problems associated with the use of plant water has been discontinued. City water has since been plumbed into the Chemical Feed Building and used in the chemical feed process. However, the water pressure is so low that the City can not dewater sludge and chlorinate at the same time. This issue is addressed in further detail later in this section.

It has been reported that the instrumentation in the Effluent Pump Control Panel does not work properly, and in some instances not at all. This results in the effluent pumps being operated in an "ON" or "OFF" mode. In addition, the Chlorine Building Alarm Panel instrumentation, emergency lighting panel, and sampler control panel do not function properly. The electrical panels in this structure should be closely evaluated before this process is expanded or utilized on a more frequent basis.

An exhaust fan is located in the chemical feed room. This fan exhausts to the exterior of the building. In the event of a Cl_2 or SO_2 leak this fan will exhaust the chemical to the outside of the building. This practice should be re-evaluated.

7.5.8.4 Chlorination/Dechlorination Recommendations

The equipment in the chlorination/dechlorination process is approaching its expected useful life. If the chlorination/dechlorination process is to be kept in service it is recommended that an evaluation be performed and the equipment rehabilitated and upgraded designed and installed as necessary to meet future design conditions. The requirements of the local fire department, air district, NEC, and NFPA 820 should be determined and included into the design of any upgrades. This may include, but is not limited to, the chlorine containment and scrubbing equipment. Conversion of the facility to hypochlorite should be considered.

If the chlorination process is to be kept in service the electrical panels and MCC's should be thoroughly evaluated. Based on the outcome of this analysis, specific improvements and upgrades should be designed and implemented.

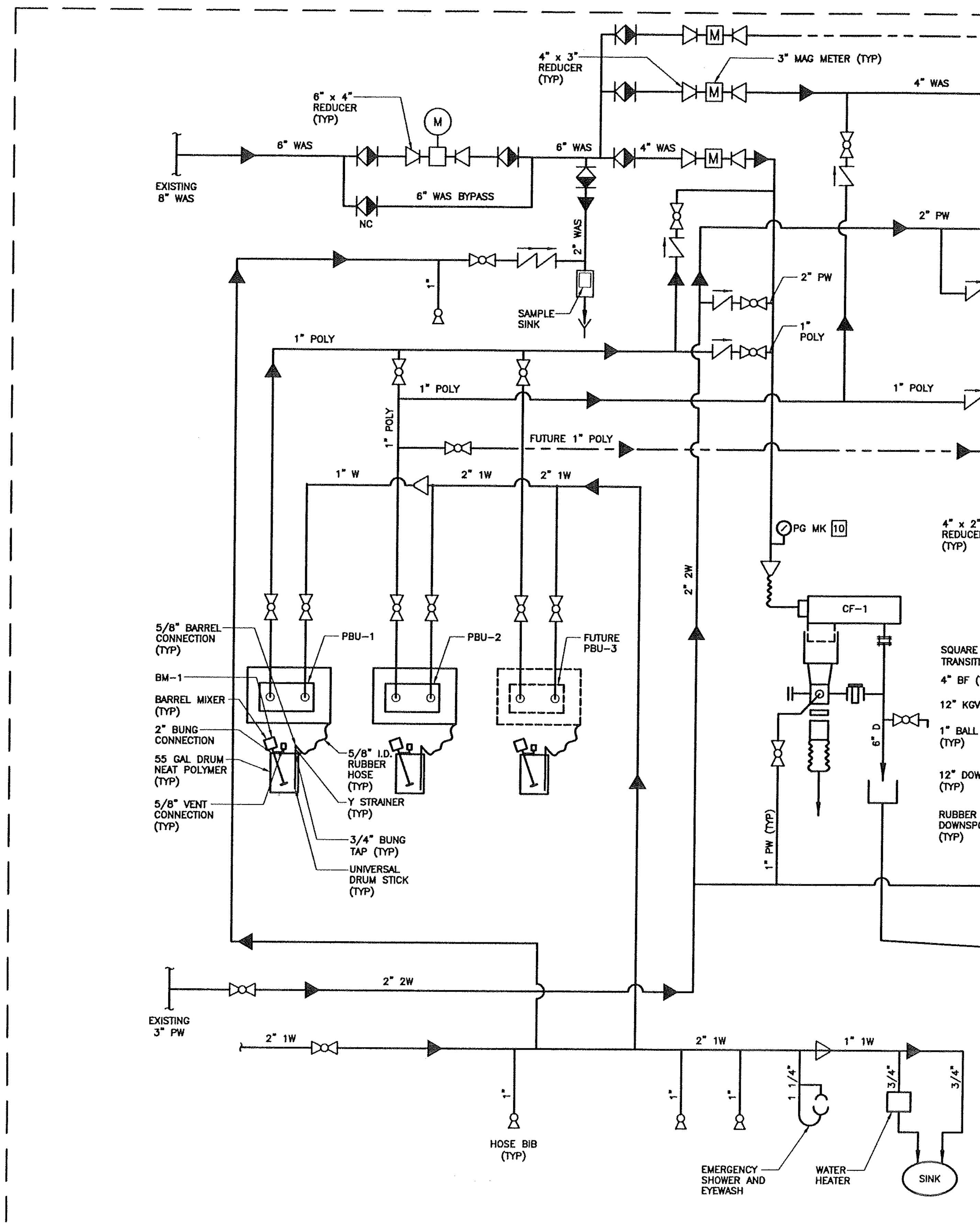
7.5.9 Biosolids Handling Facilities

7.5.9.1 Existing Conditions

The sludge dewatering system was installed in 1996. The system consists of an in-line grinder, two magnetic flow meters, two polymer feed and injection systems, and two centrifuges. These components work in conjunction with the WAS pumps discussed in Section 7.4.4.2 and as shown schematically in Figure 7.28.

From the WAS pumps the sludge passes through an in-line grinder to grind up plastics and other trash prior to dewatering. After the sludge passes through the grinder, polymer is injected into the WAS feed prior to the introduction into the centrifuges. The polymer aids in the liquid/solids separation process. The conditioned WAS is then introduced into the one of the two centrifuges as shown in Figure 7.29 and further defined in Table 7.7. The individual inlet piping to each centrifuge includes a magnetic flow meter. These meters monitor the WAS flow rates, and provide the flow signal for control as shown in Figure 7.30. A screw

Figure 7.29 Sludge Dewatering Centrifuge


4" x 3" REDUCER (TYP)
3" MAG METER (TYP)
4" WAS
6" x 4" REDUCER (TYP)
M
EXISTING 8" WAS
6" WAS
6" WAS BYPASS
NC
6" WAS
4" WAS
2" WAS
2" PW
1"
SAMPLE SINK
2" PW
1" POLY
1" POLY
1" POLY
1" POLY
1" POLY
FUTURE 1" POLY
1" W
2" 1W
2" 1W
PG MK 10
4" x 2" REDUCER (TYP)
2" 2W
CF-1
5/8" BARREL CONNECTION (TYP)
BM-1
BARREL MIXER (TYP)
2" BUNG CONNECTION
55 GAL DRUM NEAT POLYMER (TYP)
5/8" VENT CONNECTION (TYP)
PBU-1
PBU-2
FUTURE PBU-3
5/8" I.D. RUBBER HOSE (TYP)
Y STRAINER (TYP)
3/4" BUNG TAP (TYP)
UNIVERSAL DRUM STICK (TYP)
SQUARE TRANSITI
4" BF (
12" KGV
1" BALL (TYP)
6" D
12" DOW (TYP)
RUBBER DOWNSPO (TYP)
1" PW (TYP)
EXISTING 3" PW
2" 2W
2" 1W
2" 1W
1" 1W
1"
1"
1"
1 1/4"
3/4"
3/4"
HOSE BIB (TYP)
EMERGENCY SHOWER AND EYEWASH
WATER HEATER
SINK

conveyor inside the bowl of the centrifuge removes the thickened sludge. The thickened sludge then drops through chutes and into a truck. Currently the City hauls the dewatered cake to McCarthy Farms for further treatment and disposal. The centrate or liquid from the dewatering process flows through gravity drain piping to a sump where it is pumped back to the oxidation ditch for treatment.

Table 7.7 Centrifuge Design Parameters
Wastewater Treatment Plant Master Plan
City of Reedley

Parameter	Value
Number of Centrifuges	2
Type	High Speed Horizontal
Capacity, each	30 to 75 gpm
Main Drive Power, each	40 HP
Backdrive Power, each	7.5 HP
Estimated Cake Quality	18 to 20% Solids

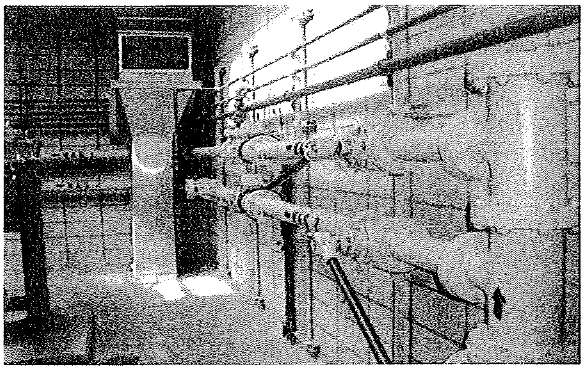


Figure 7.30 Centrifuge WAS Flow Meter

The polymer system located on the lower floor of the Centrifuge Building includes two complete polymer feed and injection systems as shown in Figure 7.31. The polymer is fed from 55 gallon drums. The use of 300 gallon totes may be more practical, especially as WAS production rates increase. Portable electric heaters were placed around the 55 gallon drums. The heaters are used to keep the polymer at an adequate temperature to prevent gelling. It may be desirable to include a more permanent heating system as part of a future project.

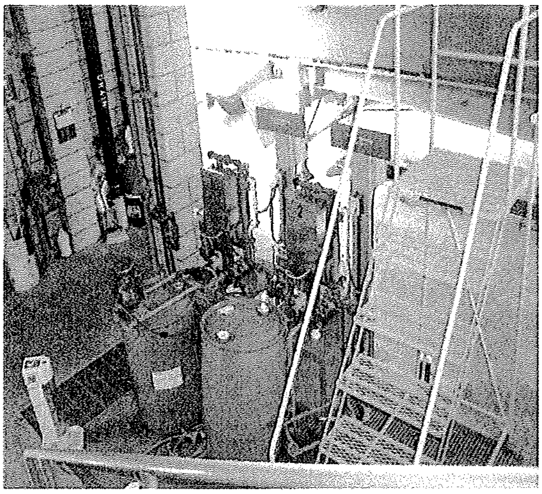


Figure 7.31 Polymer Feed System

7.5.9.2 Biosolids Handling Facilities Recommendations.

In the future as additional dewatering capacity is required the existing centrifuges will need to be replacement with larger units or additional units provided. The existing space in the dewatering building may not be large enough to replace the existing units with larger units. During the detailed design, parameters such as WAS production rates should be balanced against centrifuge operating times and schedules. This analysis will result in selecting the combination of centrifuges that will meet the production rates during the hours of operation desired by the City. As the WAS production increases, and additional WAS pumping and dewatering equipment is installed, the use of dedicated pump for each centrifuge may prove beneficial. The benefits of this modification would need to be evaluated during the final design process to determine if it is cost effective.

7.5.9.3 Addition of an Aerated Sludge Holding Tank

The WAS that is dewatered is pumped directly from the RAS wetwell to the Centrifuges. This sludge generally has a solids concentration of less than 1 percent (10,000 mg/L). Although the centrifuges efficiently dewater this sludge it may beneficial to install an aerated sludge holding tank prior to the dewatering process. With an aerated sludge holding tank the WAS could be wasted as needed to the aerated holding tank. The tank would be equipped with diffusers, blowers, and a decant system. One possible operating scenario would be to pump the WAS to the aerated tank. At predetermined times the aeration system could be turned off, and the solids allowed to settle. The liquid could then be decanted from the tank, and the aeration system turned back on. This process would allow the feed sludge to the centrifuges to increase, resulting in a more efficient dewatering system. Another benefit of a sludge holding tank is that it provides a limited amount of storage in the event that sludge cannot be dewatered for equipment maintenance or other reason. Dedicating WAS pumps to individual centrifuges would also be easier to accomplish with a sludge holding tank.

There are several existing structures that could be evaluated for use as an aerated sludge holding tank. These include the Plant 2 primary clarifier, Plant 2 secondary clarifiers, and the anaerobic digester. All of these structures are located near the sludge dewatering process. Prior to proceeding with this concept a structural evaluation and process analysis should be performed to determine if these structures are structurally sound, have adequate capacity, and would meet the requirements for the intended use.

Since the space is limited in the existing building it may required that a new structure is constructed near the existing structure. Other operational issues such as providing a space that is adequately heated to keep the polymer from jelling should be included in the design of any new building. This may be incorporated by constructing an environmentally controlled room for the polymer storage and feed equipment. Other issues such as installation of cranes or other lifting devices will also need to be evaluated during final design.

7.5.10 Sludge Drying Beds

In the event that the dewatering system is not in operation and there is an emergency, the WAS can be directed to one of several solar sludge drying beds. There are six sludge drying beds located just to the west of the Centrifuge Building, and two asphalt-lined sludge drying beds located north of percolation Pond No. 7 near the scum drying beds. The total area of the sludge drying beds is approximately 102,200 ft^2. In the event that the sludge beds are used they will need to be scraped clean when the sludge is dried. The dried sludge can be trucked to McCarthy Farms with the dewatered sludge from the centrifuges.

7.5.11 Scum Drying Beds

7.5.11.1 Existing Conditions

The scum that is removed from the surface of the oxidation ditch and secondary clarifiers is pumped to one of four unlined solar drying beds. These beds are located north of percolation Pond No. 7. These beds have a combined surface area of 25,500 ft^2. The current method of operation is to feed one bed while the other beds are drying. When a bed is full it is isolated and the scum is pumped to another bed. When the scum has dried it is removed from the beds and delivered with the dewatered sludge to McCarthy Farms.

7.5.11.2 Scum Drying Beds Recommendations

City staff has indicated that the evaporation rates are slow, especially during the colder months. Additionally, when scum layer on the beds hinders the evaporation of the decant liquid. To aid in the drying process and to extend the feeding cycle time, it is recommended that when additional scum beds are constructed in the future that a decanting system be installed. A decant system would allow the liquid to be removed from the scum and pumped back to the WWTP for treatment. Repair of clarifier collection troughs would reduce water to the scum beds. This should be handled when the clarifiers are rehabilitated.

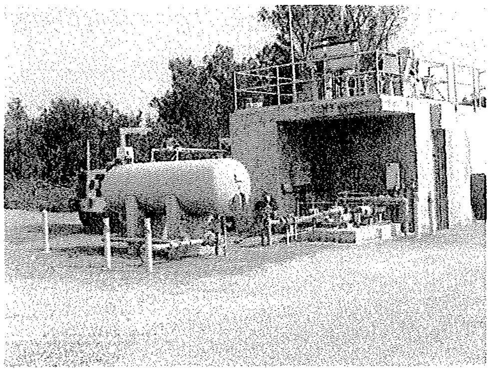


Figure 7.32 Plant Water System

7.5.12 Non Potable Water System

7.5.12.1 Existing Conditions

The non potable (plant) water system supplies secondary effluent to the hose bibs and fire hydrants around the plant as well as the landscape irrigation system. All hose bibs and the plant water delivery points are labeled with signs warning that the water is not to be used for human consumption. The plant water system is located under the Effluent Pump Station Distribution Box as shown in Figure 7.32.

The non-potable water pumps discharge into a 750 gallon hydropneumatic tank. These pumps are constant speed, two stage, split case type, each with a rated capacity of 100 gpm when operated against a TDH of 120 feet. Each pump is powered by a 10 horsepower electric motor. These pumps are provided with self-lubricated mechanical seals and grease lubricate bearings. Since the seal is water lubricated, the pump suction line contains a foot valve which is intended to insure priming prior to start up. However, the pumps must be prevented from operating dry at any time. If the pumps loose their prime they can run dry, wrecking the seals and possibly the pump itself.

The pumps operate to automatically maintain a minimum pressure of 70 pounds per square inch (psi) in the plant water system. The pumps incorporate a duplex basket strainer on the discharge to remove particulates which may clog downstream equipment. This strainer is not used because it frequently plugs with algae.

7.5.12.2 Non-Potable Water System Recommendations

According to plant staff these pumps have been a source of ongoing problems. These problems include the pumps losing their prime, inadequate flow, low pressure issues, and downstream fouling. Due to the age of the mechanical components of the plant system it is recommended that a new system be designed to accommodate the existing, as well as the future needs. As part of this work the quality of the plant water should be evaluated to determine for what uses it is suitable.

7.5.13 City Water Supply

7.5.13.1 Existing Conditions

Potable water is supplied by the Reedley Municipal Water Department's distribution system. The Plant is provided with a two-inch service including water meter and backflow preventer. This two-inch connection is provided at the end of an 8-inch water main. Potable water is supplied within the plant to the Operations Building, the Chlorination/Dechlorination Building, the RAS Pump Station and the Sludge Dewatering Facility.

The water pressure and volume through this connection has been reported to be inadequate. According to operating and maintenance personnel the sludge dewatering process and disinfection process cannot be operated simultaneously due to a lack of both water pressure and volume. As the plant grows and additional uses for water becomes necessary the problem will only worsen.

7.5.13.2 City Water Supply Recommendations

It is suggested that as part of a future project a new water service be provided to the WWTP. This service will need to be designed to meet all of the safeguards for protecting the City water system. This new service will likely come from the north or west of the WWTP. During final design the benefits of looping the new service with the existing service should be evaluated.

7.5.14 Buildings

7.5.14.1 Control/Laboratory Building

The existing building houses an office, electrical room, laboratory, and one restroom. The size of the office and laboratory are very limited. As the flows increase, and discharge requirements become more stringent the need for additional laboratory space may be required.

As part of a future project, it is recommended that Administration staff be relocated to a new building and this building be modified and expanded to provide additional laboratory space. Other features to be considered include adding additional locker/restrooms to accommodate both sexes, a combination break /meeting room, kitchenette, and storage. The office would be converted from the administration office to the laboratory office. A preliminary layout of these modification is shown in Figure 7.33. The administration and control functions would then need to be relocated to a new building to be included as part of a future project.

7.5.14.2 Shop

The existing shop is located in the same building as the standby generator. The area of the shop is limited, and does not provide adequate space to repair the large equipment used in wastewater treatment process.

As part of a future project the addition of a larger shop should be considered. This building may also house a garage for vehicular storage. Provisions for truck drive through, cranes or A-frames to unload and move equipment, and other similar features should be jointly determined with City staff. If a new shop area is provided in the future, this space could easily be converted to storage.

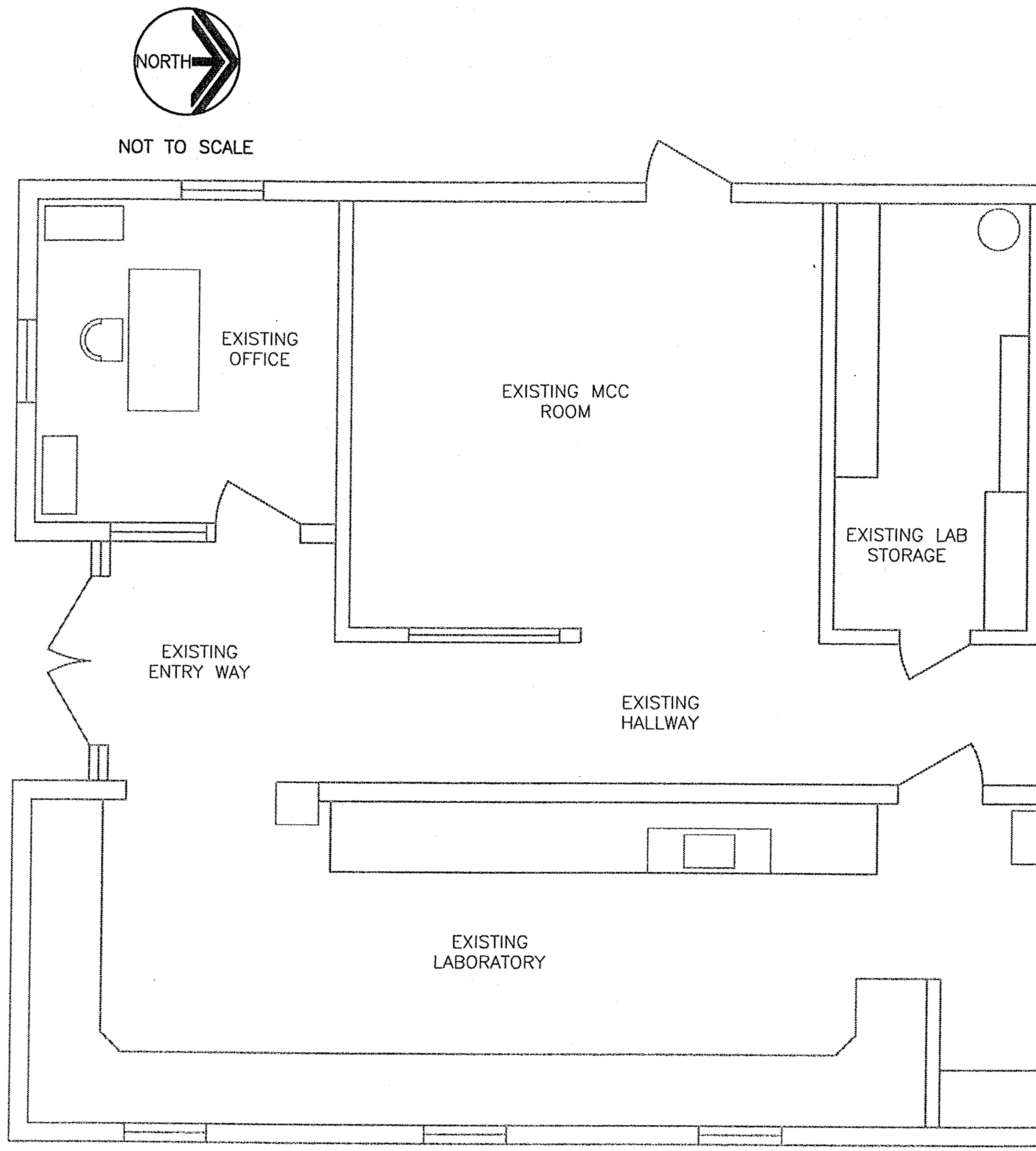
7.5.15 Miscellaneous Electrical Issues

The following write up is not in any way a replacement for a thorough electrical evaluation. It does however, point out a few areas of concerns relating to the electrical components that were discussed during our site visits to the WWTP.

7.5.15.1 Standby Generator

The existing standby generator is well maintained and kept in good operating condition. It is housed in an enclosure which protects it from the elements. The generator is powered by a Caterpillar 3406 diesel engine. The generator has a rating of 260 Kw. During the design of recommended

improvements a detailed electrical study is recommended to determine what additional standby capacity is needed, and what loads should be placed on the standby system.The diesel fuel storage tank for the standby generator is manufactured from steel, and is located



H:\Client\Reedley_FNO\6294G00\Dwg\FIGURE 7.33A 1-18-06 09:00am rgiarta XREFS: FIGURE6-34;

in a steel secondary containment structure as shown in Figure 7.34. The secondary containment structure is prone to rusting and the system requires frequent maintenance. During a future design project it is recommended that this, and other fuel tanks be replaced with “Convault” or equal double contained fuel storage tanks.

Figure 7.34 Standby Generator Fuel Tank

7.5.15.2 Electrical Manhole

Located adjacent to the existing Headworks is a buried electrical vault shown in Figure 7.35. This vault is located in a low spot in the paved access areas and is prone to flooding. It is unknown what effects this flooding has had on the electrical components and wiring in this vault. As part of a future project the condition of the electrical components should be evaluated and improvements such as re-grading the drainage away from the vault, installing a water proof cover, and most importantly installing a sump pump should be considered.

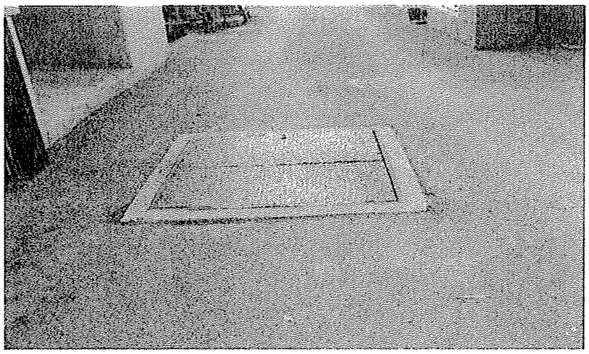


Figure 7.35 Electrical Vault

7.5.15.3 RAS Pump Station

Located on the back wall of the RAS Pump station is an Electrical Junction Box shown in Figure 7.36. According to Plant staff, water has been observed draining from this box. Since the conduits that exit this structure run below grade, it is unlikely that the source of the water will be located. Regardless, the condition of the electrical equipment and wiring should be evaluated as part of a future project.

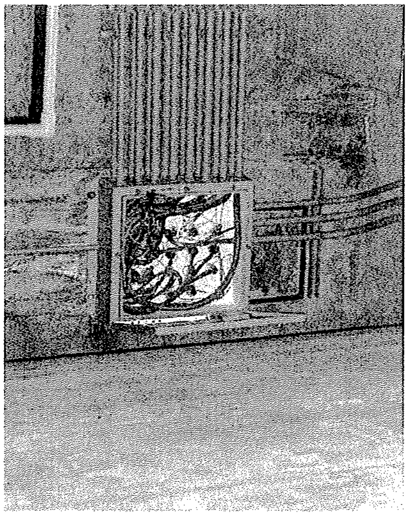


Figure 7.36 Electrical Vault

PRELIMINARY TREATMENT EVALUATION

8.1 SUMMARY

The processes included in the preliminary treatment evaluation include screening, flow metering, sampling, and grit removal. All of these processes are based on hydraulics and must be able to efficiently handle the peak hourly flows. Wastewater treatment, effluent disposal and biosolids handling alternatives are evaluated in following chapters.

It is common and appropriate for headworks facilities to be sized for the projected flows for a 40-year planning period. Therefore, the peak hour design flow is 25 mgd. The new headworks is recommended to be located at the Plant No. 1 site. The facilities would include screening sampling, and metering. Grit removal can be included as desired.

Two mechanical bar screens are recommended. Each would have capacity for half of the design flow. A manually cleaned bar screen would be provided for emergency situations. Two vortex grit removal chambers are recommended if grit removal is included. It is also recommended that a dump station be provided for the vactor truck that the City is considering buying. The estimated cost of the new headworks facility is $2,021,000. The cost without grit removal is $1,148,000.

8.2 PRELIMINARY TREATMENT

8.2.1 General

Preliminary treatment is an extremely important area in the treatment of wastewater. Here trash is removed from the wastewater prior to biological treatment. The removal of grit and other heavy inorganic material is also accomplished in this stage of the treatment plant. Removing these contaminants prior to the secondary treatment has several benefits, and often improves the quality of both the effluent and the final biosolids products. Other important functions that take place in the preliminary treatment area include influent sampling, flow metering, and monitoring.

For the purpose of this analysis, the engineer has suggested that a 40-year planning horizon be used in lieu of the 25-year planning period previously identified and used for the other alternatives analyzed in the Master Plan. This variance in the planning period is due to two primary criteria.

- The hydraulic capacity of the preliminary treatment units must be capable of handling peak flows to the WWTP while minimizing the potential for overflows.
- These facilities are generally difficult to expand. This is due in part to the open channel configuration of the process, and the size, function and operating characteristics of the preliminary treatment equipment.

Based on the above criteria the hydraulic capacity of the headworks used for this analysis is shown in Table 8.1 below.

Table 8.1 Preliminary Treatment Design Flows - Years 2030 and 2045
Wastewater Treatment Plant Master Plan
City of Reedley

Parameter	Year 2030 Flows	Year 2045 Flows
AAD Flow	6.03 mgd	10.00 mgd
MMAD Flow	6.88 mgd	11.40 mgd
PH Flow	15.08 mgd	25.00 mgd

As previously stated in Chapter 7, it is recommended that the existing preliminary treatment structure be abandoned and new facilities constructed. Based on that recommendation, this evaluation assumes that new preliminary treatment processes will be designed and constructed to accommodate the peak hourly flows for the 40-year planning period.

8.2.2 Location

For construction purposes, it is mandatory that the existing headworks remain in service while the new preliminary treatment facilities are being constructed. Additionally, it is recommended that the new preliminary treatment facilities be located in a convenient area where the influent can easily be directed. An ideal location is the area just east of the existing oxidation ditch where Plant No. 1 is currently located.

8.3 HEADWORKS

8.3.1 Wastewater Sources

Currently the City receives wastewater from two primary sources, a 12-inch force main from the Reed Avenue Pump Station and the 21-inch Olsen Bridge Siphon. In addition to these two main sources of wastewater, there are other smaller pumped flows from a mobile home park and a residential development. These wastewater sources, as well as flows from the WWTP drain system must be directed to the new headworks. There are several alternatives that are possible to combine the various flows. For the purpose of this analysis it is assumed that the piping from each source of wastewater would be isolated and the pipe extended to the new headworks structure. This would require that each source of wastewater be temporarily pumped while the pipe being extended is under constructed. It is recommended that this assumption be further evaluated and refined during the design process.

8.3.2 Screening

Once the wastewater has been combined and enters the headworks structure it will be directed through a screening process. To provide for reliability and redundancy at least two screens will be installed. A bypass channel will also be incorporated that will direct the influent wastewater through a manually cleaned bar rack in the event that a screen is out of service.

The screen opening size is what determines the amount of trash removed from the influent flow. Over the past several years the trend in the screening process has been to install screens with smaller openings. The smaller screen size has resulted in improved operation and maintenance of downstream equipment and processes by removing material that can clog pumps, aeration equipment and foul biosolids handling equipment. However, with the smaller screen openings, fecal material is also removed. The amount of fecal material removed at Reedley is less likely to be an issue than at other WWTP's. This is due to the raw wastewater being pumped prior to arriving at the WWTP which tends to break up fecal material.

To remove residual fecal material from the screenings, they are passed through a washing and compacting device. The first step in this process is to introduce high pressure wash water into the washing zone of the equipment. This aids in dissolving and liquefying the fecal material. The second step in the process is compaction. During this step the liquefied waste is squeezed from the screenings and introduced back into the influent flow. The washed, compacted, and dewatered screenings are then deposited into a dumpster for disposal.

There are several manufacturers of screening equipment that incorporate washing and compacting features that will meet the needs of the City. Depending on the actual location and configuration of the screens the use of a conveyor may be required to transport the dewatered and compacted screenings to the dumpster or receiving bin. "Climber" screens have been chosen for many Valley plants in the past five years. This type of screen can be seen at Hanford, Wasco, Exeter and Lindsay.

8.3.3 Influent Sampling

Located downstream from the screening process is the recommended location for the influent sampling station. Locating the sampler in this location will minimize the clogging of the sampler draw tube from trash and rags. It is recommended that the sampler be capable of collecting time paced and flow paced samples. The sampler should incorporate a refrigerated sample storage area large enough to hold a composite sample from a 24-hour sampling period. The sampler should be capable of being controlled either manually or be flow paced using the signal from the influent meter.

8.3.4 Influent Flow Metering

Also downstream from the screening processes is the ideal location for the influent flow meter. It is envisioned that the headworks can be constructed high enough to eliminate the need for pumping to the downstream treatment units. This assumption will need to be verified during the design phase of the project. Based on this assumption the use of a Parshall flume would be the recommended influent flow meter. To measure flow through a Parshall flume the liquid depth as the flows pass through the throat of the meter is measured. This liquid depth is then converted to flow. Measuring this depth and converting it to flow is generally accomplished using an ultrasonic level indicator and transmitter.

8.3.5 Recommended Headworks Facility

The recommended headworks for the City of Reedley will include screening with screening washing and compacting, flow metering, and influent sampling. The opinion of probable capital costs for the recommended headworks is outlined in Table 8.2 below.

Table 8.2 Opinion of Probable Capital Costs - Headworks
Wastewater Treatment Plant Master Plan
City of Reedley

Component	Estimated Costs
Wastewater Collection (Piping) Improvements	$150,000
Screening Structure	$300,000
Screening, Washing and Compacting Equipment	$100,000
Influent Sampler	$5,000
Flow Metering	$25,000
Misc. Piping	$25,000
Miscellaneous Equipment	$25,000
Subtotal	$630,000
Site Work (10%)	$63,000
Electrical (20%)	$125,000
Instrumentation (5%)	$30,000
Coatings (2%)	$12,000
Estimated Sub-Total	$860,000
Estimating Contingencies (25%)	$215,000
Estimated Total (1)	$1,075,000

(1) Costs do not include influent pumping at the WWTP

8.4 GRIT REMOVAL

8.4.1 Alternatives

Grit removal is an important process as it protects downstream equipment and minimizes loss of reactor basin volume due to grit deposition. Two types of grit removal processes that are being widely used today are the vortex grit removal and the aerated grit removal.

The vortex grit removal system relies on induced vortex to capture the grit solids in the center hopper of a circular tank. The collected grit is then pumped to a grit classifier where the organics are removed and the grit dewatered prior to being deposited into a dumpster or receiving bin for disposal. The advantages and disadvantages of vortex grit removal are shown in Table 8.3 below. An example of a vortex grit removal system can be seen at the City of Hanford's WWTP.

Table 8.3 Advantages and Disadvantages of Vortex Grit Removal
Wastewater Treatment Plant Master Plan
City of Reedley

Advantages	Disadvantages
Effective over a wide range of flows	Some designs are proprietary
No submerged bearings or parts that require maintenance	Paddles and baffles may collect rags
Requires minimum space resulting in less construction costs	Grit collection sump may clog is not removed frequently
Minimal hydraulic headloss	
Energy efficient	
Removes high percentage of grit	
Note: Adopted from WEF Manual of Practice No. 8, 1992, page 418.	

The aerated grit removal process incorporates the introduction of diffused air along one side of a long and narrow concrete basin. This causes a spiral roll velocity pattern in the basin. During this process, the heavier grit particles settle to the bottom where they are collected using augers or screws that transport the grit to a collection sump. The collected grit is then periodically removed from the sump using augers or pumps. The removed grit is then classified where the organics are removed and the grit dewatered prior to being placed in a dumpster for disposal. The advantages and disadvantages of using aerated grit removal are outlined in Table 8.4. An aerated grit removal facility can be seen at the City of Wasco's WWTP.

Table 8.4	Advantages and Disadvantages of Aerated Grit Removal Wastewater Treatment Plant Master Plan City of Reedley
Advantages	**Disadvantages**
Effective over a wide range of flows	Higher power consumption than vortex grit removal
Minimal hydraulic headloss	Higher labor and maintenance costs
Low organic content in collected grit	Grit collection sump may clog if grit is not removed frequently
Pre-aeration may alleviate septic conditions	Potentially harmful and or odorous volatiles compounds and aerosols are released during this process
Process Flexibility	
Note: Adopted from WEF Manual of Practice No. 8, 1992, page 413.	

8.4.2 Recommended Grit Removal Process

Based on the cost effectiveness and lower operating and maintenance costs associated with vortex grit removal, it is the recommended process for the City if grit removal is to be incorporated into the design. The grit removal facility could easily be designed and constructed separately at a later date than the Headworks. This concept will be further defined in Chapter 12. The opinion of probable construction costs for this process is shown in Table 8.5 below.

Table 8.5	Opinion of Probable Capital Costs - Grit Removal Wastewater Treatment Plant Master Plan City of Reedley
Component	**Estimated Costs**
Grit Removal Structure	$300,000
Vortex Grit Removal Equipment	$75,000
Grit Pumps	$25,000
Grit Classifiers	$60,000
Grit and Misc. Piping	$25,000
Miscellaneous Equipment	$25,000
Subtotal	$510,000
Site Work (10%)	$51,000
Electrical (20%)	$102,000
Instrumentation (5%)	$25,000
Coatings (2%)	$10,000

Table 8.5	Opinion of Probable Capital Costs - Grit Removal Wastewater Treatment Plant Master Plan City of Reedley
Component	**Estimated Costs**
Estimated Sub-Total	$698,000
Estimating Contingencies (25%)	$175,000
Estimated Total [1]	$873,000
(1) Costs do not include influent pump station	

8.5 VACTOR TRUCK DUMP STATION

The City is considering buying a Vactor Truck to be used for sewer maintenance and cleaning. It is recommended that the wastewater and debris removed from the sewers during the cleaning process be treated at the wastewater treatment plant. To accomplish this a dump station designed specifically for vacuum trucks should be constructed. Vendor supplied package receiving stations that screen debris and remove grit will be evaluated during design. It should be noted that this dump station would not be designed for receiving septage or other trucked wastes. The waste collected during the sewer cleaning process should be screened to remove any large debris and introduced into the headworks. This location is recommended since the debris removed from the sewers can contain high amounts of trash which should be removed prior to biological treatment.

Due to the elevation of the headworks as compared to the ground elevation it is likely that the Vactor truck dump station will need to pump the liquid up to the headworks. This pump station could possibly be designed to receive other plant drains as the need arises. It is envisioned that the flows from the Vactor truck dump station would be relatively minor. However, if desired by the City a flow meter could be installed on the discharge of the pumps to meter the flows from the station.

The opinion of probable capital costs for the Vactor truck dump station is shown in Table 8.6 below.

Table 8.6	Opinion of Probable Capital Costs - Vactor Truck Station Wastewater Treatment Plant Master Plan City of Reedley
Component	**Estimated Cost**
Structure	$15,000
Pumps	$15,000
Misc. Piping and Equipment	$10,000
Subtotal	$40,000
Site Work (10%)	$4,000

Table 8.6 Opinion of Probable Capital Costs - Vactor Truck Station Wastewater Treatment Plant Master Plan City of Reedley	
Component	**Estimated Cost**
Electrical (20%)	$8,000
Instrumentation (5%)	$1,000
Coatings (12%)	$5,000
Estimated Sub-Total	$58,000
Estimating Contingencies (25%)	$15,000
Estimated Total	$73,000

8.6 RECOMMENDED PRELIMINARY TREATMENT FACILITIES

The recommended preliminary treatment facilities will be elevated above finished grade and be constructed of concrete. The structure will be open to the atmosphere. It is envisioned that the wastewater will flow through one of two bar screens, each capable of handling the peak hourly flow. A bypass channel will be constructed such that in a high flow event, or if a bar screen is out of service that flows can be passed through a manually cleaned bar screen. Following the screening process will be the influent flow sampler and flow metering. Following sampling and metering, the wastewater will flow through one of two vortex grit removal units, each capable of removing the grit from a peak flow 12.5 mgd. Provisions to bypass flows around the grit removal processes will be provided in the event that a unit is out of service. A schematic of recommended preliminary treatment facilities is shown in Figure 8.1. The opinion of probable capital costs for these recommended improvements is outlined in Table 8.7.

Table 8.7 Opinion of Probable Capital Costs - Preliminary Treatment Wastewater Treatment Plant Master Plan City of Reedley	
Process	**Estimated Costs**
Headworks (screening, sampling and metering)	$1,075,000
Grit Removal	$873,000
Vactor Truck Dump Station	$73,000
Estimated Total	$2,021,000

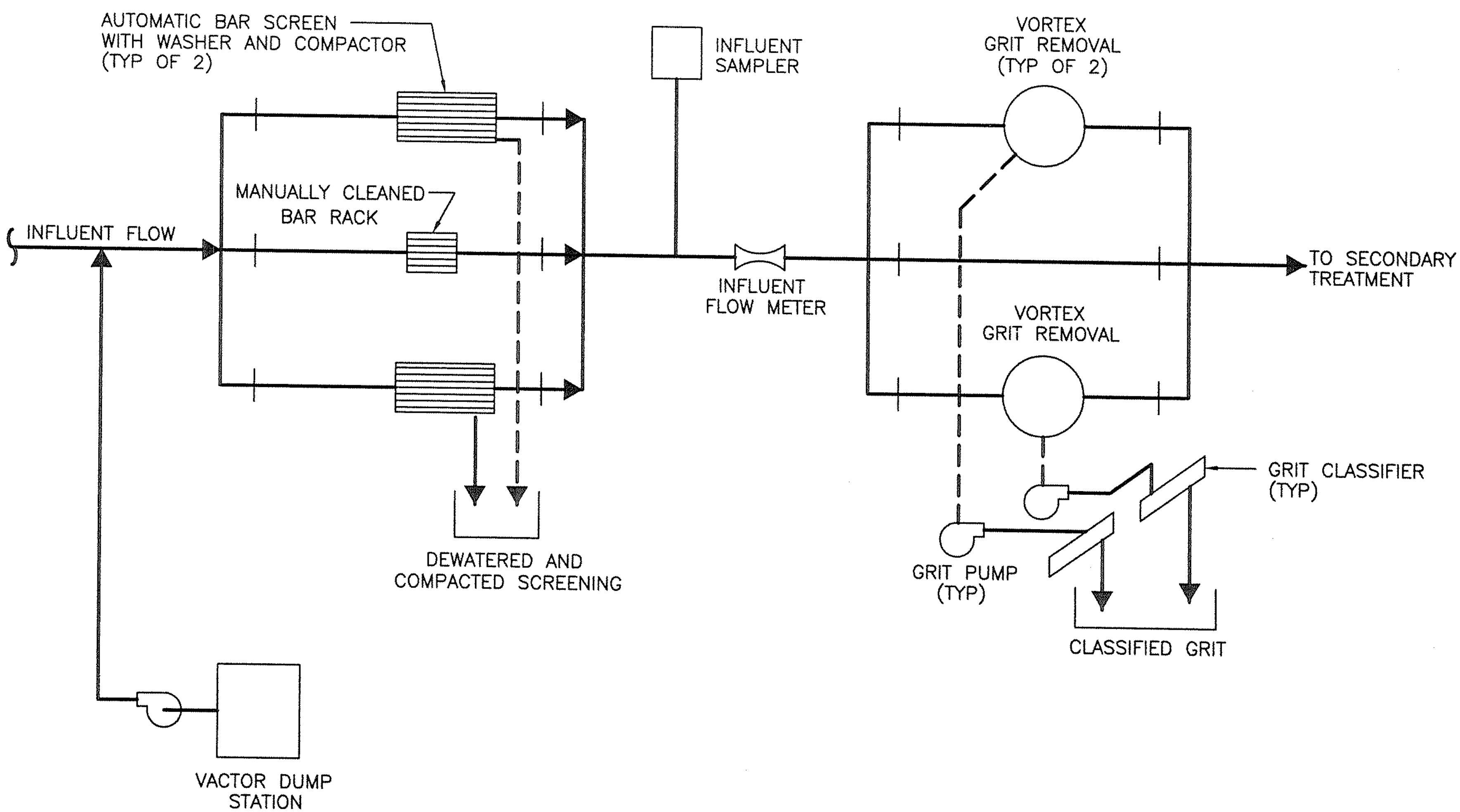


Figure 8.1

PRELIMINARY TREATMENT SCHEMATIC
WASTEWATER TREATMENT PLANT MASTER PLAN
CITY OF REEDLEY

carollo engineers

SECONDARY TREATMENT EVALUATION

9.1 SUMMARY

Four alternatives are considered for expanding the City's wastewater treatment plant. These are 1) the trickling filter process; 2) the sequencing batch reactor process; 3) membrane reactors; and 4) extended aeration process. All of these alternatives would be designed to remove nitrogen to comply with anticipated future regulatory requirements.

The effluent quality from a trickling filter plant is not as high a quality as the other alternatives and is not a recommended process for nitrification/denitrification. In addition, there are more supporting treatment facilities, i.e. primary clarifiers, anaerobic digesters, etc., required. Finally, trickling filters have a history of producing odors. Therefore, this alternative is not recommended for the City of Reedley.

The sequencing batch reactor (SBR) process has generally been associated with small plants. This process requires extensive automation to sequence the various basins and provide for continuous flow. In addition, it would be a new process for the plant staff to learn. The SBR process would require the operation of two different plants. Therefore, this alternative is not recommended.

The third alternative considered is membrane bioreactors (MBR). This is the most expensive alternative. The capital cost is estimated to be between $17 and $20 million. It does produce the highest quality of water that complies with Title 22 unrestricted use requirements. However, because of its higher costs and not needing to produce Title 22 water, the MBR process is not recommended for the plant expansion.

The fourth alternative is the extended aeration process of which an oxidation ditch is typical. The estimated capital cost for two oxidation ditches, three secondary clarifiers, and a RAS pump station is $9,839,000. Additional facilities that would be required are rehabilitation of the existing oxidation ditch and a new effluent pump station. These two facilities would add approximately another $2.5 million. This is the recommended alternative to expand the Reedley wastewater treatment plant at a total capital cost of $12,332,000. The plant staff is familiar with the process and it will not add any complexity to operating the plant.

9.2 SECONDARY TREATMENT ALTERNATIVES EVALUATION

For this analysis, secondary treatment includes biological oxidation, secondary clarification, and associated sludge pumping facilities. Four alternatives are included in this analysis. They are the trickling filter process, sequencing batch reactors, membrane bioreactors, and extended aeration activated sludge.

9.2.1 Trickling Filter Process

The trickling filter is a fixed film process where organic materials are removed from the wastewater as it passes through a synthetic media. The media supports a layer of biological film, or zoogleal slime, typically comprised of a large and diverse population of living organisms. As the wastewater enters the filter medium, the microorganisms absorb the dissolved organics from the waste material to sustain their growth and reproduction. As the organisms grow, the slime layer increases in thickness, and the organic matter is metabolized before it can reach the microorganisms near the face of the media, creating an endogenous zone. Thus, the microorganisms lose their ability to cling to the media surface, and sloughing of the slime layer occurs as wastewater flows through the media, allowing a new slime layer to grow.

High-rate trickling filters have higher organic loading than conventional low-rate filters, and include recirculation of the filter effluent to return soluble BOD to the organisms on the media, which improves treatment efficiency. To accommodate this higher organic loading, high rate filters incorporate plastic media. This media varies in depth from 8 foot to over 20 feet. In designing a high rate trickling filter process, the organic and hydraulic loadings are among the important factors that must be considered. The typical design parameters for a high-rate, plastic media filter are presented in Table 9.1.

Table 9.1 High-Rate Trickling Filter Typical Design Parameters
Wastewater Treatment Plant Master Plan
City of Reedley

Parameter	Value
Hydraulic Loading, gal/ft^2/min	0.16 - 0.64
BOD_5 Loading, lbs/10^3 ft^3/day	30 - 60
Depth, ft	3 - 6
Recirculation Ration	1 - 2
Sloughing	Continuous
BOD_5 Removal Efficiency, %	65 - 85
Effluent	Little Nitrification

In order to have an effective trickling filter process, several processes must be in place upstream of the filter(s). A preliminary treatment process, including bar screens and/or grit removal, is necessary to remove trash and other items from the influent stream prior to the filter process. Poor removal of rags and debris in the preliminary treatment process can have detrimental effects on the operation of the trickling filter. If not removed, the material will be deposited on the surface of the filter and plug the media and orifices of the trickling filter mechanism.

Primary clarification is also required upstream of the filter to remove settleable solids, trash, and grease, and their excessive organic loading. An increase in organic loading increases the potential for filter media plugging, higher concentration of secondary sludge, and decreased BOD removal efficiency. In addition, if grease and scum are not removed prior to filter absorption, the treatment efficiency of the media is greatly hindered. With the use of primary clarifiers, anaerobic digestion will likely be required to digest the raw primary sludge.

Table 9.2 lists the advantages and disadvantages to using a trickling filter process as the secondary treatment process for the Reedley WWTP.

Table 9.2 Advantages and Disadvantages for Trickling Filter Process
Wastewater Treatment Plant Master Plan
City of Reedley

Advantages	Disadvantages
Consistant treatment efficiency.	Recirculation pumps are required to recirculate effluent.
Low operator attention	Primary clarifiers would be required upstream of the filter process.
Generally lower power costs than activated sludge processes	Unlikely that the RWQCB would consider trickling filter technology as BPTC based on recent decisions and directions observed.
	Odors.
	Anaerobic digesters are recommended to digest raw primary sludge.

At this time the City does not utilize the trickling filter process or its associated primary clarification and anaerobic digestion facilities. Incorporating this process would result in the City constructing additional structures for these processes. Therefore, using the trickling filter process would actually result in more operation and maintenance associated with the additional treatment processes. In summary, the City would be operating two treatment plants, each with different operating parameters and effluent characteristics.

The effluent from the trickling filter process is generally not as high quality as that from an activated sludge process, particularly relating to nitrification and de-nitrification. With the ever changing regulations, the potential need for completely nitrifying and denitrifying the wastewater prior to discharge, and the added operations and maintenance burdens related with the required primary treatment processes, the trickling filter process is not recommended for the City of Reedley.

9.2.2 Sequencing Batch Reactors

The sequencing batch reactor (SBR) is a fill and draw system that involves a complete-mix reactor that incorporates a series of treatment cycles or steps into a single unit. The five treatment steps include the following:

- Step 1 - Fill. The purpose of the fill step is to add raw wastewater or primary effluent to the reactor.
- Step 2 - React. During this step aeration and mixing of reactor contents takes place. This is equivalent to the same process that takes place in a standard activated sludge reactor.
- Step 3 - Settle. During this step the aeration and mixing is turned off and the mixed liquor allowed to settle simulating the process in a standard secondary clarifier.
- Step 4 - Draw. During this process the withdrawal of the treated reactor takes place. The removal of the treated wastewater is generally accomplished with a floating decant system.
- Step 5 - Idle. During the idle step the waste sludge is removed from the reactor.

Sequencing batch reactors have biological operating characteristics very similar to extended aeration activated sludge wastewater treatment plants. Typical design parameters for the sequencing batch reactors are presented in Table 9.3 below.

Table 9.3 Sequencing Batch Reactors Typical Design Parameters
Wastewater Treatment Plant Master Plan
City of Reedley

Parameter	Value
Hydraulic Retention Time, hrs	12 - 50
BOD_5 Loading, lbs/10^3 ft^3/day	5 - 15
MLSS, mg/L	1,500 - 5,000

Sludge wasting is an important step in the SBR operation that greatly affects performance. The amount and frequency of the sludge wasting is determined by performance requirements. It occurs during the idle cycles. A unique feature of the SBR process is that it does not require return activated sludge (RAS) to maintain the sludge content in the aeration chamber. Because both aeration and settling occur in the same chamber, no sludge is lost in the reaction step. However, either flow equalization basins or multiple reactors are required to accommodate a continuous flow of wastewater through the treatment process. Table 9.4 lists the advantages and disadvantages of the SBR treatment process.

Table 9.4	Advantages and Disadvantages of SBR Treatment Process Wastewater Treatment Plant Master Plan City of Reedley
Advantages	**Disadvantages**
Elimination of secondary clarifier and RAS pumping.	Relative lack of operational experience by City staff with the process.
High tolerance for peak flows and shock loadings	Need for multiple units or flow equalization basins.
Capable of nitrifying and denitrifying	If Title 22 water is required in the future effluent filtration would be required at an additional cost.
	Need multiple units to account for reliability and redundancy since the reactor and clarifier are in the same tank

The use of SBRs has generally been associated with smaller flows from resorts and small isolated residential or commercial developments. There are relatively few installations at larger municipal installations. Since the SBR process includes both aeration and clarification in the tankage, a complete standby unit must be provided for reliability and redundancy requirements. For instance, if an SBR tank is taken off line for any reason the City would lose both an aeration basin and secondary clarifier at the same time. Incorporating SBR technology at the City of Reedley's WWTP would require adding a new process which would result in a learning curve for operation and maintenance staff. For these reasons the use of SBR technology is not recommended for the City of Reedley.

9.2.3 Membrane Bioreactors

Membrane bioreactors (MBR) can provide organic and suspended solids removal in one step. The use of MBR technology eliminates the need for conventional secondary clarification and effluent filtration as the solids separation and filtration steps are accomplished by the membranes. Because the clarifiers are eliminated, the effects attributed to filamentous organisms and the associated poorly settling sludge are also eliminated.

To provide nitrified and denitrified effluent, an anoxic selector basin is required. Piping flexibility is provided to allow the MLSS recycle, RAS, and raw wastewater to be step fed into the different zones in the selector. This allows the operators the needed flexibility to meet changing influent conditions and effluent limitations. Additionally the membrane manufacturers require that a fine screen be installed before the membranes to remove hair and other small material that may blind the membranes. These screens are located upstream of the selection/aeration basin and are in addition to the bar screens located in the headworks.

Without operating under the limitations of the conventional clarification process, the activated sludge process in a MBR plant can be operated at very high concentrations of MLSS of up to 10,000 - 12,000 mg/L. The existing oxidation ditch would require substantial retrofitting including diffused aeration equipment and baffling to handle the high organic and MLSS loadings. Even with these retrofits, it is likely that an additional 1 MG of aeration volume would be needed when the MMAD flows approach 5.8 mgd.

Following the retrofitted oxidation ditch would be the membrane bioreactor tank. This structure would be constructed of concrete and would be compartmentalized to house individual trains of membrane cassettes. This allows the cassettes to be isolated for in place cleaning. A crane can also be supplied to lift the cassettes out of the membrane bioreactor tank if needed. This structure would be covered to protect the cassettes and associated equipment from the elements.

Air would be introduced into the bottom of the membrane tank. The air would be discharged through diffusers to scour the outside of the membranes. This process keeps the material from collecting on the outside of the membranes and limiting their capacity. The system would include air blowers, air columns, and air separation columns.

Centrifugal pumps would be used to draw the mixed liquor through the membranes. As the mixed liquor passes through the membrane, the solids would be rejected and the clear permeate (effluent) passed through the membrane. With a membrane pore size of 0.04 microns, the effluent would be of high enough quality that effluent filtration would not be needed even for Title 22 disinfected tertiary reclaimed water.

In addition to a series of permeate pumps, a backpulse pumping system would be required. This system would include a series of pumps, piping and valving to allow the membranes to be periodically backpulsed. A cleaning system would be required to keep the membranes at their peak performance. This system would include the piping and valving to clean the membranes in place.

As with any activated sludge process, return sludge and waste sludge pumping facilities would be required. In addition, sludge recirculation pumps would also be required.

To control the system DO probes and turbidity analyzers are required for each train. A PLC/PC control system would be provided by the manufacturer to control the functions of the membrane bioreactor system. It is recommended that the majority of the equipment, including the membranes, be housed in a building. This building would incorporate a separate control room. Table 9.5 lists the advantages and disadvantages of the MBR treatment process.

Table 9.5 Advantages and Disadvantages of the MBR Process Wastewater Treatment Plant Master Plan City of Reedley	
Advantages	**Disadvantages**
Elimination of secondary clarifiers and conventional filtration (if needed)	Generally more expensive per gallon than other activated sludge processes
High tolerance for wide variations in organic loadings	Need Blowers and diffused aeration system.
Capable of nitrifying and denitrifying	Requires more operator attention
Cassettes can be added to match flows	Requires more mechanical equipment than other forms of activated sludge treatment.
Provides full Title 22 unrestricted use effluent for parks, cemeteries, and crop irrigation.	MBR's have specific loading rates or capacities. This requires that enough cassettes be installed to handle any peak flows and cassette down time.
	This technology does not have the long history of operating like more conventional biological systems.

Based on previous projects, the estimated costs for an MBR system, including retrofitting of the existing aeration system, is between $2.50 and 3.00 per gpd. At 6.9 mgd this equates to an estimated secondary treatment cost of $17,200,000 and $20,700,000 for the secondary treatment facilities. The extended aeration activated sludge alternative costs outlined in the next section provides an estimated savings of approximately $10,000,000 for comparable treatment capacity. Therefore, the incremental costs to move to MBR treatment are on the order of $7,000,000 or more. If filtration is required in the future for Title 22 water, the cost based on current filtration technology would likely still be less than the incremental difference. So, unless there is a known need to produce Title 22 water, it does not seem practical to construct an MBR at this time.

Although MBR's produce a high quality effluent, it is not recommended to be implemented at the City of Reedley. This is primarily due to the higher costs than other conventional treatment technologies, the higher degree of personnel training, and maintenance tasks associated with MBR's.

An MBR process could be added in the future to follow the oxidation ditches. Because it would be treating secondary effluent, an MBR could treat much higher flow rates. This would achieve the same benefit at greater reliability.

9.2.4 Extended Aeration Activated Sludge

The extended aeration process usually is accomplished in an oval shaped channel equipped with mechanical aeration devices such as an oxidation ditch. Pre-screened wastewater enters the aeration basin or reactor, where it is aerated as it circulates around the basin. The extended aeration process is characterized by long hydraulic detention times between 15 and 24 hours and a long solids retention time between 20 - 30 days. Due to the long hydraulic and solids retention time the process generally is very efficient at nitrifying the ammonia. Depending on the relative locations of wastewater input and removal, sludge return, and the aeration equipment, oxidation ditches can also achieve denitrification. To aid in the denitrification process a mixed non-aerated zone can be easily installed to provide the conditions needed for denitrification. Secondary clarifiers are used in conjunction with the oxidation ditches to provide for separation and return of MLSS to the oxidation ditch. Typical design values for the extended aeration process are shown in Table 9.6.

Table 9.6 Extended Aeration Activated Sludge Typical Design Parameters
Wastewater Treatment Plant Master Plan
City of Reedley

Parameter	Value
Hydraulic Retention Time, hrs	18 - 36
BOD_5 Loading, $lbs/10^3\ ft^3/day$	10 - 25
Sludge Age, days	20 - 30
MLSS, mg/L	1,500 - 5,000

Some advantages and disadvantages to extended aeration process is presented in Table 9.7.

Table 9.7 Advantages and Disadvantages of Extended Aeration Process
Wastewater Treatment Plant Master Plan
City of Reedley

Advantages	Disadvantages
The racetrack type design promotes plug flow.	Energy costs are slightly higher than for the trickling filter processes
BOD_5 removal is typically high 75-95 percent.	If Title 22 water is required in the future, filtration is needed at an additional cost.
Extended aeration can be easily adapted to provide for nitrification and denitrification	
Effluent quality is generally very good.	
Very easy to operate and maintain	
Extended aeration is very forgiving and is able to handle shock loadings and wide variations in flows with little impact to the effluent quality.	

9.3 RECOMMENDED SECONDARY TREATMENT ALTERNATIVE

The extended aeration process provides the greatest flexibility of operation of the alternatives evaluated. It can easily be operated to provide for a nitrified and denitrified effluent while being relatively easy to operate and maintain. It is capable of handling wide fluctuations in both flows and loadings. The City currently operates an oxidation ditch, which is an extended aeration process. Providing additional extended aeration facilities will provide the City with a biological treatment system that they understand and have a good working knowledge of how to operate and maintain. Extended aeration facilities are generally very cost effective to construct and operate due to their relatively simple design. This process can be easily constructed in phases. For these reasons, utilizing the extended aeration system is the recommended secondary treatment process for the City of Reedley. The individual components of the recommended secondary treatment system are discussed in further detail in the remainder of this chapter.

9.3.1 Design Parameters

The secondary treatment process will be designed based on the design criteria previously identified in Section 3.5.4, and as summarized in Table 9.8.

Table 9.8 Secondary Treatment Design Parameters For Year 2030
Wastewater Treatment Plant Master Plan
City of Reedley

Parameter	Value
AAD Flow	6.03 mgd
MMAD Flow	6.88 mgd
PH Flow	15.08 mgd
MMAD BOD_5 Concentration	190 mg/L
MMAD BOD_5 Loading	10,902 ppd
MMAD TSS Concentration	220 mg/L
MMAD TSS Loading	12,623 ppd
TKN Concentration	25 mg/L
TKN Loading	1,435 ppd

9.3.2 Secondary Treatment Splitter Structure

Upstream from the extended aeration process will be the secondary treatment flow splitter structure. This structure will be used to direct the screened wastewater to the downstream extended aeration basins. It is envisioned that the splitter structure will be able to split the flow to the existing as well as the proposed treatment units. The flow will be split between the individual treatment units using weirs, each sized to match the treatment capacity of the individual treatment units. In addition to splitting the flow the splitter box will be outfitted with sluice or slide gates. These gates will allow the operators to isolate a treatment unit and take it off line if needed. The splitter structure will be constructed at an elevation that will allow the wastewater to flow by gravity from the preliminary treatment processes to the aeration basins. The actual configuration of the secondary treatment splitter structure will be finalized during the design phase when the actual size and number of treatment units has been established. The opinion of probable costs for the secondary treatment splitter structure is outlined in Table 9.9.

Table 9.9 Opinion of Probable Capital Costs - Secondary Treatment Splitter Structure Wastewater Treatment Plant Master Plan City of Reedley

Component	Estimated Costs
Structure	$40,000
Gates	$25,000
Miscellaneous Equipment	$2,000
Subtotal	$67,000
Site Work (10%)	$7,000
Electrical (20%)	$13,000
Instrumentation (05%)	$3,000
Coatings (2%)	$1,000
Estimated Sub-Total	$91,000
Estimating Contingencies (25%)	$23,000
Estimated Total	$114,000

9.3.3 New Extended Aeration Basins

It is anticipated that the existing oxidation ditch will continue to be utilized in conjunction with the new extended aeration basins. Based on previous design documents and analysis the existing oxidation ditch has a MMAD capacity of 3.0 mgd. With the year 2030 MMAD flow of approximately 6.9 mgd, the new extended aeration facilities will have a MMAD capacity of approximately 3.9 mgd. Based on a hydraulic detention time of 24 hours, an additional 3.9 million gallons of treatment volume will be required. At this volume the MMAD organic loading would be 11.8 lbs BOD_5/1000 ft^3-day. This organic loading is within the acceptable range of 10 to 25 lbs BOD_5/1000 ft^3-day. The above hydraulic and organic loadings should be revisited during the design phase to confirm actual basin sizing criteria.

These basins will be designed for biological denitrification. To accomplish this a small anoxic zone will be provided where the screened wastewater will be introduced with and mixed with the nitrate (NO_3) rich MLSS and the RAS. In the anoxic zone the biomass in the RAS will utilize the oxygen from the NO_3 molecule to oxidize the BOD_5. The byproduct of

RAS will utilize the oxygen from the NO_3 molecule to oxidize the BOD_5. The byproduct of this reaction is nitrogen gas, which is released to the atmosphere. Following the anoxic zone is the aeration zone. Here the BOD_5 is further reduced and the ammonia (NH_3) is oxidized to NO_3. At the end of the aeration zone the mixed liquor is introduced back to the anoxic zone and the process repeats itself. To keep the contents of the anoxic zone in suspension, submerged mixers are installed. These mixers agitate and mix the contents of the anoxic zones without adding oxygen.

To avoid pumping the mixed liquor from the aeration zone to the anoxic zone a flow through arrangement such as a Carrousel system is recommended. This system is configured in such a manner that the mixed liquor flows into the anoxic basin without the need for pumps. The mixed liquor flow into the anoxic zone is controlled by swing gates. This type of a configuration is generally deeper than the standard oxidation ditch and is constructed with vertical reinforced concrete walls. The vertical walls provide a cost savings, as it will allow the new aeration basins to be constructed using common wall construction techniques.

For extended aeration plants, 1.5 lbs of O_2 is required to oxidize 1 lb of BOD_5. Likewise the oxygen needed to oxidize NH_3 to NO_3 is 4.6 lbs of O_2 per lb of NH_3. Based on the year 2030 design conditions, this results in an estimated total O_2 demand of 22,954 lbs per day, as calculated in the following equation. It should be noted that this calculation assumes that the influent TKN loading is all in the form of NH_3, which will result in a slightly conservative total O_2 value.

$$(1.5 \text{ lbs } O_2 \times 10{,}902 \text{ lbs } BOD_5\text{- day}) + (4.6 \text{ lbs } O_2 \times 1{,}435 \text{ lbs } NH_3\text{-day})$$

For the purpose of this evaluation it is assumed that the air will be supplied to the aeration basin using slow speed vertical aerators. This type of aerator generally has a field oxygen transfer efficiency of 1.2 - 2.4 lbs O_2/hp-hr. Assuming a transfer efficiency of 2 lbs O_2/hp-hr results in a 2030 aeration horsepower requirement of 478 horsepower or approximately 500 horsepower based on the following equation.

$$(22{,}954 \text{ lbs } O_2/\text{day}) \times (\text{day}/24 \text{ hr}) \times (\text{hp-hr}/ 2 \text{ lbs } O_2)$$

It is recommended that this value be confirmed during the design process based on the actual size and configuration of the extended aeration basins and other facilities.

A logical approach to constructing the basins would be to construct two basins each with a capacity to treat about 2 mgd. This approach would allow the City the flexibility to take a basin out of service periodically for maintenance. It is envisioned that these new extended aeration basins will be located to the west of the existing oxidation ditch.

As with any activated sludge process the return activated sludge (RAS) or biomass must be returned to the aeration basin to provide the biomass needed to oxidize the waste. The RAS may be introduced with the wastewater at the secondary splitter structure discussed above, or it may be discharged directly into the individual extended aeration basins. The

RAS is returned from the bottom of the secondary clarifier by the RAS pumps, which is discussed later in this section. The opinion of probable costs for the extended aeration basins is outlined in Table 9.10.

Table 9.10 Opinion of Probable Capital Costs - Two New Extended Aeration Basins Wastewater Treatment Plant Master Plan City of Reedley

Component	Estimated Costs
Structures	$1,650,000
Mechanical Aerators and Equipment	$1,000,000
Subtotal	$2,650,000
Site Work (10%)	$265,000
Electrical (20%)	$530,000
Instrumentation (05%)	$133,000
Coatings (2%)	$53,000
Estimated Sub-Total	$3,631,000
Estimating Contingencies (25%)	$908,000
Estimated Total	$4,539,000

9.3.4 Improvements to Existing Oxidation Ditch

Once the new extended aeration basins are on-line, it is recommended that the existing oxidation ditch be taken off line, evaluated and repairs made as outline in Section 7.4.2.2. These repairs include replacing the aeration equipment, and structural rehabilitation and other necessary improvements.

In addition to the repairs and rehabilitation, a new anoxic selector basin will be required to meet the anticipated effluent nitrogen limits. This anoxic basin will be located hydraulically upstream from the existing oxidation ditch. To make the anoxic basin function properly will require that the RAS raw wastewater piping be modified so that they are routed to the beginning of the anoxic selector and not the oxidation ditch. Additionally, a pump station will be required to pump the mixed liquor from the oxidation ditch to the anoxic basin. It is envisioned that this pump station will be constructed near the existing oxidation ditch effluent chamber, and the mixed liquor will be pumped to the anoxic basin. However, the mixed liquor could also flow by gravity to a pump station located near the anoxic basin. It is recommended that the actual location of the mixed liquor pump station be finalized during final design. For the purpose of this report it is assumed that the pump station will be located near the existing oxidation ditch effluent chamber and will pump to the new anoxic basin.

The mixed liquor pump station will be sized to pump up to five times the MMAD flow (5 x 3 mgd) or 15 mgd to the anoxic basin. Assuming, that the total dynamic head (TDH) between the mixed liquor pump station and the anoxic basin is 30 feet, this will require an estimated 125 horsepower to pump the mixed liquor to the anoxic selector. To accomplish this it is recommended that multiple pumps be incorporated. These pumps can be controlled based on influent flow or other operating parameters. The use of VFD drives is assumed for this analysis but should be confirmed during the design phase. As with any pump station the individual pump discharge piping should incorporate check valves, isolation valves and pressure gages and switches. Air release valves will be required at any high points in the piping system.

The opinion of probable costs shown in Table 9.11 is based on providing four submersible type pumps equipped with VFD drives.

Table 9.11 Opinion of Probable Capital Costs - Improvements to Existing Oxidation Ditch
Wastewater Treatment Plant Master Plan
City of Reedley

Component	Estimated Costs
Anoxic Selector Structure	$375,000
Mixed Liquor Pump Station Structure	$150,000
Mixed Liquor Pumps, Mixers, and Mechanical Equipment	$150,000
Oxidation Ditch Repair and Rehabilitation	$250,000
Subtotal	$925,000
Site Work (10%)	$93,000
Electrical (20%)	$185,000
Instrumentation (05%)	$46,000
Coatings (2%)	$18,000
Estimated Sub-Total	$1,267,000
Estimating Contingencies (25%)	$317,000
Estimated Total	$1,584,000

9.3.5 Mixed Liquor Flow Splitter Structure

Following the extended aeration process will be the mixed liquor flow splitter structure. This structure will be used to direct the mixed liquor from the extended aeration basins to the secondary clarifiers. The flow will be split between the individual secondary clarifiers using weirs, each sized to match the treatment capacity of the individual clarifier. In addition to splitting the flow the splitter structure will be outfitted with sluice or slide gates. These gates will allow the operators to isolate a secondary clarifier if needed. The splitter structure will be constructed at an elevation that will allow the wastewater to flow by gravity from the extended aeration basins to the secondary clarifiers. The actual configuration of the mixed liquor flow splitter structure will be finalized during the design phase. The opinion of probable costs for the mixed liquor flow splitter structure is outlined in Table 9.12.

Table 9.12 Opinion of Probable Capital Costs - Mixed Liquor Splitter Box Wastewater Treatment Plant Master Plan City of Reedley

Component	Estimated Costs
Structure	$40,000
Gates	$25,000
Miscellaneous Equipment	$2,000
Subtotal	$67,000
Site Work (10%)	$7,000
Electrical (20%)	$13,000
Instrumentation (05%)	$3,000
Coatings (2%)	$1,000
Estimated Sub-Total	$91,000
Estimating Contingencies (25%)	$23,000
Estimated Total	$114,000

9.3.6 Secondary Clarification

The secondary clarifiers will receive the MLSS from the MLSS splitter box. The clarified liquid will flow over the weirs and flow by gravity to the effluent pump station discussed later in this chapter. The scum that is removed from the surface of the clarifiers will be pumped to the scum drying beds. The settled solids will be removed from the bottom of the clarifier by the RAS/WAS pump station.

Based on the MMAD flow of 6.9 mgd additional secondary clarifiers will be required. The existing secondary clarifiers each have a capacity of about 1.25 mgd. At this flow the overflow rate is 344 gpd/ft^2. Based on this analysis the new clarifiers will be required to treat 4.4 mgd. It is envisioned that three new 85-foot diameter secondary clarifiers will be installed to operate in parallel with the two existing 68-foot diameter secondary clarifiers. The new secondary clarifiers are sized such that the overflow rates will not exceed 400 gpm/ft^2 with one of the new 85-foot diameter clarifiers out of service. Using this configuration the combined overflow rates both with and without one of the proposed 85-foot diameters clarifiers out of service is below 400 gpd/ft^2 as shown in Table 9.13. It is planned that the new clarifiers will be located north of the new extended aeration basins.

Table 9.13 Secondary Clarifier Operating and Design Criteria Wastewater Treatment Plant Master Plan City of Reedley, California			
Parameter	**Five Clarifiers in Service**	**Four Clarifier in Service**	**Typical Design Range**
Number of Secondary Clarifiers in Service	Three 85 ft. dia Two 68 ft. dia.	Two 85 ft. dia Two 68 ft. dia.	-
Overflow Rate at MMAD	283 gpd/ft^2	370 gpd/ft^2	200 - 400 gpd/ft^2
Solids Loading at MMAD (1)	9.45 lb/ft^2-day.	12.33 lb/ft^2- day	< 24 lb/ft^2-day
(1) Based on a MLSS of 4000 mg/L			

As shown in Table 9.13, with all of the clarifiers in service the clarifiers will be operating within generally accepted operating ranges. Likewise, when one of the 85-foot diameter clarifiers is out of service the four remaining online clarifiers also will be operating within generally accepted ranges and meet the Reliability and Redundancy Requirements of Title 22.

When the new clarifiers are on line it is recommended that the existing clarifiers be taken off line and rehabilitated. For the purpose of this report it is assumed that the new sludge removal mechanism and weirs will be replaced. The opinion of probable construction costs for the secondary clarifiers is outlined in Table 9.14.

Table 9.14 Opinion of Probable Capital Costs - Secondary Clarifiers Wastewater Treatment Plant Master Plan City of Reedley	
Component	**Estimated Costs**
Structures (3)	$1,200,000
Clarifier Mechanisms (3)	$675,000
Scum Pumps	30,000
Repair and Rehabilitation of two Existing Clarifiers	$450,000
Subtotal	$2,355,000
Site Work (10%)	$236,000
Electrical (20%)	$471,000
Instrumentation (5%)	$118,000
Coatings (2%)	$47,000
Estimated Sub-Total	$3,227,000
Estimating Contingencies (25%)	$807,000
Estimated Total	$4,034,000

9.3.7 RAS/WAS Pumping

A new RAS/WAS pump station will be required to serve the new secondary clarifiers. This pump station will be similar in features to the existing RAS/WAS pump station. The pump station will house the RAS pumps which will pump the RAS back to the aeration basins. The RAS pumps will be of the centrifugal solids handling type. The pumps will be sized to return up to 150 percent of the MMAD flow back to the aeration basins. Multiple pumps will be provided to perform this work. For process flexibility, VFD's are recommended. A RAS flow meter(s) will be required to control the RAS rate. Each pump will incorporate suction isolation valves as well as discharge isolation and check valves. The pumps will be outfitted with pressure gages and switches for protection. Seal water system will be provided for flushing the pump seals. For the purpose of this analysis, it is assumed that four RAS pumps will be installed, each with a 25 horsepower motor. The pumps will be sized such that three pumps can do the work and the fourth will be a standby. The actual size and configuration of the RAS Pumps will be determined during the design process.

In addition to the RAS pumps, WAS pumps will also be installed in this pump station. The WAS pumps are planned to be a positive displacement type that will deliver the WAS to the biosolids treatment processes discussed in Chapter 10. Similar to the RAS pumps the WAS pumps will also incorporate suction isolation valves and discharge check and isolation valves. Each pump will be outfitted with a pressure gage and switch to provide protection. Seal water and other ancillary equipment will also be included. For the purpose of this analysis it is assumed that four, 25 horsepower pumps will be provided. The pumps will be sized such that three can perform the work and the fourth pump will be a standby. As with the RAS pumps it is recommended that the actual size and configuration be finalized during the design process.

The proposed location for the new RAS/WAS pump station is near the new secondary clarifiers, north of the aeration basins. The opinion of probable capital costs is outlined in Table 9.15.

9.3.8 Effluent Pump Station

The effluent from the secondary clarifiers will flow to a new effluent pump station. Once the new effluent pump station is on line the existing effluent pump station will be taken off line. It is planned that this lift station will incorporate centrifugal submersible pumps. The pump station will be designed to handle the peak hour 2030 flow with provisions to allow it to be expandable for future flows. The new effluent pump station will pump the secondary effluent to the percolation ponds.

To meet the varied pumping requirements, multiple pumps will be provided to perform this work. For flexibility, VFD's are recommended. A flow meter will be required to monitor the effluent discharged to the percolation ponds, as well as for process control. Each pump will incorporate suction isolation valves as well as discharge isolation and check valves. The pumps will be outfitted with pressure gages and switches for protection. A standby pump will be provided for reliability and redundancy requirements.

**Table 9.15 Opinion of Probable Capital Costs - RAS/WAS Pump Station
Wastewater Treatment Plant Master Plan
City of Reedley**

Component	Estimated Costs
Pump Station Structure	$300,000
RAS Pumps and Equipment	$60,000
WAS Pumps and Equipment	$45,000
Piping and Valving	175,000
Misc. Metal	25,000
Subtotal	$605,000
Site Work (10%)	$60,000
Electrical (20%)	$120,000
Instrumentation (05%)	$30,000
Coatings (2%)	$15,000
Estimated Sub-Total	$830,000
Estimating Contingencies (25%)	$208,000
Estimated Total	$1,038,000

Assuming that four pumps will be provided, three to perform the work with the fourth being a standby, each pump will be rated at approximately 3500 gpm. Based on a TDH of 40 feet, each pump would be equipped with a 50 horsepower motor. The actual size and configuration of the pump station will be finalized during the design process.

The proposed location for the new effluent pump station is located west of the new secondary clarifiers. The opinion of probable capital costs is outlined in Table 9.16.

9.4 SUMMARY OF SECONDARY TREATMENT

The recommended secondary treatment facilities will consist of a secondary treatment flow splitter structure that will direct the screened wastewater to the extended aeration basins. The existing oxidation ditch will be kept in service and two new extended aeration basins that incorporate anoxic zones for denitrification will be provided. To allow for the efficient denitrification of the wastewater treated in the existing oxidation ditch, a stand alone anoxic basin and mixed liquor pump station will be required. When the new aeration basins are on line the existing oxidation ditch should be taken off line, evaluated, and repairs and upgrades made.

Table 9.16	Opinion of Probable Capital Costs - Effluent Pump Station Wastewater Treatment Plant Master Plan City of Reedley
Component	**Estimated Costs**
Pump Station Structure	$300,000
Effluent Pumps and Equipment	$100,000
Piping and Valving	$50,000
Misc. Metal	$25,000
Subtotal	$475,000
Site Work (10%)	$48,000
Electrical (20%)	$90,000
Instrumentation (05%)	$24,000
Coatings (2%)	$10,000
Estimated Sub-Total	$647,000
Estimating Contingencies (25%)	$162,000
Estimated Total	$809,000

Following the extended aeration basins will be a mixed liquor splitter structure, which will direct the effluent from the aeration basins to the online clarifiers. It is recommended that a total of three 85-foot diameter secondary clarifiers be installed to operate in parallel with the two existing 68-foot diameter clarifiers. This configuration will provide the reliability for the City to meet its clarification needs with one basin out of service. The secondary effluent will flow by gravity to a new effluent pump station. This pump station will deliver the effluent to the percolation ponds.

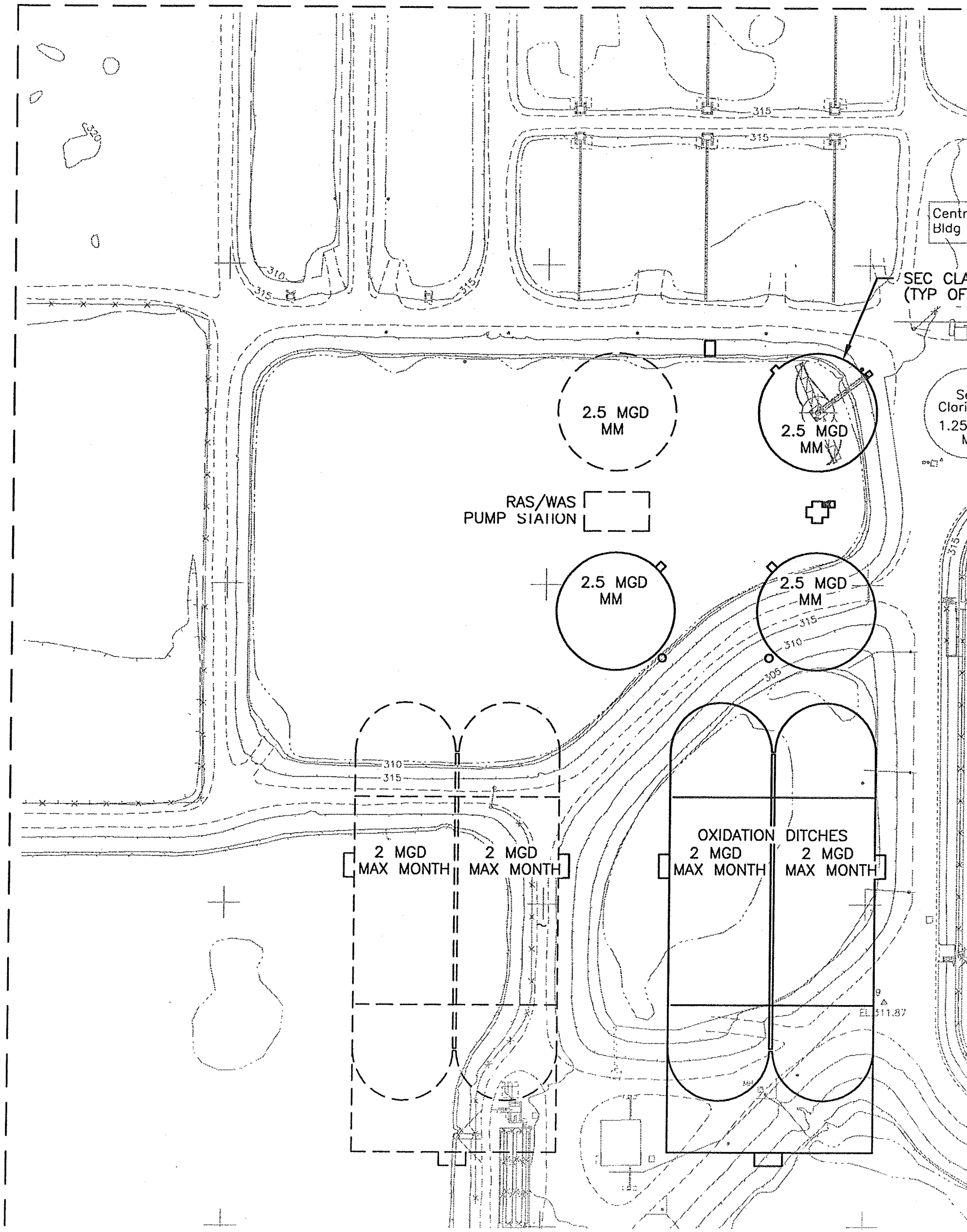
A new RAS/WAS pump station will be required to handle the solids from the new secondary clarifiers. This pump station will be similar in construction to the existing RAS/WAS pump station. The RAS pumps will return the RAS to the anoxic zones of the aeration basins while the WAS pumps will deliver the WAS to the biosolids treatment facilities.

A summary of the opinion of probable costs for the secondary treatment facilities is outlined in Table 9.17.

Table 9.17 Summary of Opinion of Probable Capital Costs - Secondary Treatment
Wastewater Treatment Plant Master Plan
Reedley, California

Component	Estimated Costs
Secondary Treatment Splitter Structure	$114,000
New Extended Aeration Basins	$4,539,000
Improvements to Existing Oxidation Ditch	$1,584,000
Mixed Liquor Splitter Structure	$114,000
Secondary Clarifiers	$4,034,000
RAS/WAS Pump Station	$1,038,000
Effluent Pump Station	$809,000
Estimated Total	$12,232,000

A preliminary site plan of the proposed facilities is shown in Figure 9.1. This site plan not only shows the recommended facilities to treat the year 2030 MMAD flows of approximately 7 mgd, but shows the facilities to treat the year 2045 MMAD flows of roughly 11 mgd.



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BIOSOLIDS TREATMENT AND REUSE EVALUATION

10.1 SUMMARY

Due to the uncertainties associated with land application of biosolids in California and the Central Valley, it is recommended that the City take a wait-and-see attitude relating to biosolids stabilization. During this time it is recommended that the City continue to dewater the WAS and truck it to the San Joaquin Composting Facility for further processing. As regulations change and become less dynamic the City can re-evaluate their biosolids treatment options. Expanding the current operation presents the least risk since it can likely be incorporated into any future biosolids treatment process the City may engage in.

Heat drying will likely be the preferred on-site biosolids treatment in the near future in the Central Valley. The expanded centrifuge dewatering facility can be used in conjunction with the heat drying process. With heat drying no additional or immediate step is required between the dewatering (centrifuges) and the heat drying process. Adopting this wait-and-see position will allow the City to easily incorporate heat drying when it becomes required or, beneficial.

When the biosolids trends become better defined, and the City chooses to investigate Class 'A' further, it is recommended that pilot testing or a demonstration project for composting and/or heat drying be further evaluated. The evaluations should include operating costs, capital costs, product quality, product quantity, marketability, potential for odors, and other factors.

Odors are a primary concern at the WWTP. The recommended biosolids dewatering facilities include expanding the centrifuge dewatering by adding another centrifuge building. This is the best option to assure a continuation of the City's objective to minimize odors from the plant. In addition to the added centrifuges, an aerated sludge holding tank should be added. The opinion of probable capital costs for the biosolids treatment facilities is $4,026,000.

10.2 INTRODUCTION

This analysis considers several alternatives including producing Class 'A' biosolids, producing Class 'B' biosolids, as well as expanding the existing facility where the WAS is dewatered and transported to an off site composting facility for further stabilization and land application.

Due to the close proximity to the residential neighborhoods and the dynamic nature of the biosolids regulation, there are several overriding factors, in addition to cost, that are used in this evaluation. These factors include, but are not necessarily limited to:

- Potential for odors
- Potential for noise
- On-site treatment
- Land requirements
- Compliance with biosolids regulations
- Operator and maintenance staff requirements
- Adaptability for use in other biosolids technologies
- Public acceptability
- Future trends of biosolids treatment and handling in the Central Valley

10.3 BIOSOLIDS TREATMENT ALTERNATIVE EVALUATIONS

10.3.1 Class 'A' On-Site Biosolids Alternatives

Three Class 'A' pathogen reduction alternatives are identified as potential on-site processes to broaden future biosolids options for the WWTP. The processes are: composting, heat drying/pelletization, and chemical stabilization, each of which is discussed below. Regardless of which onsite class 'A' stabilization method may be pursued by the City, pilot testing is recommended to assess the marketability and public acceptance of the biosolids products.

10.3.1.1 Composting

Composting is a proven technology to produce a soil conditioner and has a demonstrated operating history. This is the process currently used by the San Joaquin Composting Facility where Reedley trucks its dewatered biosolids for further treatment prior to land application by McCarthy Farms. The San Joaquin Composting Facility is located in Kings County, California.

Three common types of composting processes are windrows, aerated piles, and in-vessel systems. Green waste or wood chips are most commonly used as bulking agents and carbon sources for the process. The windrow system is the most common form of composting, where the biosolids and bulking agents are formed into long, open air piles that are turned frequently. Aerated piles are rectangular piles of compost mixture that are supplied with air through blowers connected to perforated pipes running under the piles. In-vessel systems are enclosed reactors and have the benefit of strict odor, process, and emission controls. Enclosed buildings would likely be needed for the windrow and aerated pile processes, to control odors. A summary of the features of the composting technology is presented in Table 10.1.

Table 10.1	Features of Composting Technology Wastewater Treatment Plant Master Plan City of Reedley
Uses a traditional stabilization process	
Current process used by San Joaquin Composting	
Proven process with a long track record	
Heat generated during microbial decomposition reduces pathogenic organisms	
Performed after dewatering	
Usually needs a carbon rich bulking agent such as wood chips, paper, or green waste	
Will likely require an enclosed building or area with scrubbers for odor control	

If the City should elect to pursue a composting facility in the future, it is recommended that a small demonstration facility be operated at the WWTP site similar to the demonstration project implemented by the City of Morro Bay/Cayucos Sanitary District in Morro Bay, CA. This demonstration facility would provide real world operating data and allow the City to become familiar with the operating and maintenance requirements of this process. As part of this demonstration project the City should embark on a marketability campaign to gage the public's acceptance to using the composted product. The abstract for City of Morro Bay/Cayucos Sanitary District demonstration project is included in Appendix K.

10.3.1.2 <u>Chemical Stabilization</u>

Chemical stabilization involves adding chemicals to the biosolids to elevate the pH and temperature to produce a Class 'A' biosolids product. Two chemical stabilization technologies are lime addition (pH treatment) and the N-Viro Process. Generally the chemically treated biosolids are cured in windrows. To reduce the overall land requirement, some installations use a rotary drum dryer to replace the windrow drying step. The typical Class 'A' product is a moist, soil-like granular material suitable for use as a soil amendment for acidic soils. Since Central Valley soils are naturally alkaline, there may not be high local demand for the product. A summary of the features of the chemical treatment technology is outlined in Table 10.2.

Table 10.2	Features of Chemical Treatment Technology Wastewater Treatment Plant Master Plan City of Reedley
Chemical addition to raise pH to 12	
Performed after dewatering	
High pH reduces pathogens through exothermic reactions which produces a Class 'A' biosolids product.	
Lime stabilization systems uses a pressurized system for efficiency.	
N-Viro utilizes kiln dust, lime kiln dust, fly ash, or other alkaline material.	

Table 10.2	Features of Chemical Treatment Technology Wastewater Treatment Plant Master Plan City of Reedley
If land applied, the product will raise the alkalinity of the soils	
Will require an enclosed building or area with scrubbers for odor control	

10.3.1.3 Heat Drying and Pelletization

Heat drying/pelletization reduces the moisture content and the pathogens in the biosolids by evaporation. One advantage of this technology is that the heat dried biosolids may be processed to the form and size desired by the customers. Heat drying may be accomplished by indirect or direct means, referring to whether or not the biosolids come into direct contact with the heat source. Land requirements are small, compared to composting or chemical addition. There are several manufacturers of heat drying systems. Mobile pilot-sized units are available from some manufacturers. Pelletization is a proven technology that produces a marketable product. The process has primarily been used in large facilities in the northeast United States. However facilities are becoming more common as the process gains acceptance and the biosolids rules become more stringent. A summary of the features of the heat drying/pelletization technology is outlined in Table 10.3.

Table 10.3	Features of Heat drying and Pelletization Technology Wastewater Treatment Plant Master Plan City of Reedley
Solids may or may not be stabilized	
Performed after dewatering	
Proven process with a long track record in the eastern US	
Pelletization process reduces size of biosolids particles to small pellets.	
Energy intensive mechanical process	
Mechanical agitation and auxiliary heat increase evaporation rate and reduce pathogen levels.	
Produces 95 percent solids product	
Will require an enclosed building or area with scrubbers for odor control	

The biosolids to be dried should be dewatered to 16 - 20 percent to reduce the amount of heat required to evaporate the moisture from the sludge. With the need for dewatered cake the existing centrifuges would still be required. The heat-dried cake is approximately 90 percent solids. This greatly reduces the volume of material that would need to be handled. The heat-dried material is easy to handle and is a Class 'A' material.

With the burning of natural gas (or other fuel) the equipment would need to meet the air district requirements. There are several manufacturers of this type of equipment that claim to meet these requirements. This equipment should be housed to protect it from the elements, and to capture odors. With the rising cost of petroleum products, including natural gas, careful consideration of operating costs should be evaluated.

Several years ago the City allowed Fenton Environmental Technologies to install a sludge drying demonstration project at the WWTP. The outcome of this demonstration project revealed that there may be some O&M savings associated with heat drying the dewatered WAS.

Based on this demonstration project, and recent correspondence with the dryer manufacturer, the estimated operating costs associated with dryer technology were evaluated. The evaluation was based on a year 2030 AAD flow of 6.03 mgd and a sludge production of 1,200 lbs dry solids per mgd which resulted in a year 2030 sludge production of 7,236 dry pounds per day. Assuming that the centrifuge process has a 95 percent solids capture rate, the dryer inlet feed would be 6,874 dry lbs solids per day. Assuming the dewatered WAS has an 18 percent solids concentration, the dryer inlet sludge feed would be 8,123 wet tons per year. Based on a natural gas cost of $1.00 per therm (year 2005 costs) results in an estimated natural gas cost for drying the WAS of $207,953 per year as outlined below.

Inlet sludge feed concentration = 18% solids
2,000 lbs/ton x 18% = 360 lbs of dry solids per ton
360 lbs after drying / 90% solids = 400 lbs of dewatered cake per wet ton
2,000 lbs - 400 lbs = 1600 lbs of water to be removed per wet ton
1,600 lbs of water per wet ton x 1,600 BTU's per lb = 2.56 MBTU's per ton
2.56 MBTU's /100,000 BTU per therm = 25.6 therms per wet ton
25.6 therms x 8,123 wet tons per year = 207,953 therms/year
207,953 therms / year x $1.00 / therm = $207,953 per year

The dryer would also require electricity to power the electric motors and drives. The yearly cost of electricity for the equipment is 118,300 kW-hr/ year. Based on $0.12 per kW-hr (year 2005 costs) results in an estimated yearly electrical cost of about $14,196 per year.

Assuming that the dried product (pellets) from the drying process are 90 percent solids results in 1,625 tons of dried material that would need to be transported to the land application site as calculated below. Making the assumption that the cost to truck the dried material is the same cost per ton as the dewatered WAS ($37.75/ton) equates to a hauling cost of $61,344 per year.

(400 dry lbs per ton of wet sludge x 8,123 wet tons per year / 2000 lbs per ton = 1,625 tons)

The operational costs for gas, electricity, and transportation for heat drying results in an estimated O&M cost of $283,493 per year as outlined below.

($\$207,953_{\text{gas}} + \$14,196_{\text{electric}} + 61,344_{\text{trucking}} = \$283,493$).

These costs are based on mid-2005 utility prices which are expected to vary. Another scenario would be that the heat dried Class 'A' product could be given away locally. This would reduce the gas and electric operational costs to $222,149.

Regardless if the heat dried Class 'A' product is trucked to McCarthy Farms or given away locally, the cost of the equipment and the building to house it in would need to be considered in the costs. Based on a recent quote from a manufacturer of heat drying equipment the capital costs of the heat drying facility have been estimated as outlined in Table 10.4.

Table 10.4 Opinion of Probable Capital Costs - Heat Drying Facility
Wastewater Treatment Plant Master Plan
City of Reedley

Component	Estimated Costs
Building	$700,000
Heat Drying Equipment (including Installation)	$500,000
Ancillary Equipment	$150,000
Storage Hopper	$100,000
Conveyors (to transport the dried material)	$100,000
Dewatered Cake Pumps	$100,000
Piping (From Centrifuges to Heat Drying Equipment)	$50,000
Misc. Equipment	$50,000
Subtotal	$1,750,000
Site Work (10%)	$175,000
Electrical (20%)	$350,000
Instrumentation (5%)	$88,000
Coatings (2%)	$35,000
Estimated Sub-Total	$2,398,000
Estimating Contingencies (25%)	$600,000
Estimated Total	$2,998,000

The annualized costs of the drying facility are determined based on a 20-year period and 2 percent interest. This results in an annualized cost of the drying facility of approximately $405,507 ($183,358 $_{\text{annualized capital cost}}$ + $207,953 $_{\text{gas}}$ + $14,196 $_{\text{electric}}$) without trucking costs. Since the interest rates are expected to rise over the planning period the estimated annualized cost was also calculated at four percent which results in an annualized cost of $442,741. These costs should be considered order of magnitude planning level costs which may vary significantly from the actual costs for drying sludge. It is recommended that these costs be re-visited periodically as conditions and regulations change.

Based on current rates, the cost to truck the year 2030 dewatered WAS to San Joaquin Composting Facility is $275,990 (7,311 wet tons x $37.75 per ton). This reveals that at this time the annual cost for trucking the dewatered WAS is substantially more cost effective than drying even at an interest rate of two percent. In addition to the annualized costs, drying would require additional manpower to operate the facility, and annual costs for laboratory analysis. Also, the risk for odors, noise, and other nuisances is increased with the drying alternative.

10.3.1.4 Summary of On-Site Class 'A' Biosolids Alternatives

Table 10.5 lists several of the advantages and disadvantages of Class 'A' biosolids. Heat drying appears to be the future trend of biosolids treatment.

**Table 10.5 Advantages and Disadvantages of On-Site Class 'A" Biosolids
Wastewater Treatment Plant Master Plan
City of Reedley**

Advantages	Disadvantages
Unrestricted Land Application of finished product.	Relative lack of operational experience for small to mid-size WWTP's.
	Higher potential for noise and odors than current biosolids handling process.
	Increased operation and maintenance costs.
	Chemical costs and handling for some alternatives.
	Public acceptance of biosolids.
	High energy cost that may escalate much greater than the rate of inflation.

10.3.2 Class 'B' Biosolids

The two most common technologies for producing a Class 'B' biosolids product on-site are anaerobic digestion and aerobic digestion. Solar drying also produces a Class B sludge but is not considered viable at Reedley due to the residential housing nearby. These two common technologies are included in the biosolids analysis for the City of Reedley and are summarized below. It is assumed that for both of these Class 'B' technologies, the WAS will be thickened to at least 4 percent solids prior to treatment. The thickening of the WAS has several benefits including requiring less digestion volume and lower energy requirements.

10.3.2.1 Anaerobic Digestion

The anaerobic digestion process is a proven method of reducing the volatile solids content of the waste sludge. The anaerobic digestion process includes three distinct phases. Each one of these phases is interrelated and dependent upon one another.

The first phase is hydrolysis where the proteins, lipids, and other complex organic substances are solublized. During the second phase, the products of the first phase are converted to organic acids. In the third phase, methane formation takes place as the organic acids are converted to methane gas, carbon dioxide, and other byproducts.

The facilities needed for this alternative include concrete digesters, a digestion control building, sludge heating equipment, digester gas safety equipment, a waste gas flare, sludge mixing, and pumping equipment. Operating in complete-mix mode, all of the digesters would be heated and mixed. There are several design criteria associated with designing anaerobic digesters. The four most common criteria are: volatile solids loading (lbs VSS/ft^3-day), hydraulic detention time (days), solids retention time (days), and mixing intensity (turnover time).

As noted in Chapter 3, the biosolids production rate is projected at 1,200 dry lbs of biosolids per MG of wastewater treated. Based on an AAD flow of 6.03 MGD (Section 3.5.4), the year 2030 biosolids production rate is approximately 7,236 lbs biosolids/day. Generally accepted operating data reveals an average volatile solids of 70 percent of the total solids, resulting in a design VSS loading rate of 5,065 lbs/day to the digesters. For design, it is assumed that only 80 percent of the volume of a digester is useable with the remaining volume occupied by grit, trash and other undesirable material. Therefore, the minimum design volume for the digesters based on VSS loading is approximately 80,000 ft^3. The primary design criteria for the anaerobic digestion process is outlined in table 10.6.

During the anaerobic process, gas is produced as a byproduct. This gas generally has a low heat content that ranges from 500 to 650 BTU/ft^3, with a typical value of 600 BTU/ft^3. The typical characteristics of this gas are outlined in Table10.7. A typical gas production value for the anaerobic digestion process is 15 ft^3/lb VSS destroyed which results in an estimated gas production of approximately 53,000 ft^3/day at the year 2030 design condition.

Table 10.6 Anaerobic Digestion - Recommended Design Criteria
Wastewater Treatment Plant Master Plan
City of Reedley

Parameter	Value
Volatile Solids Loading	< 80 lbs VSS/1000 ft^3-day
Volatile Solids Destruction	70%
Solids Retention Time	> 20 days
Hydraulic Retention Time	> 20 days

Table 10.7	Typical Digester Gas Composition Wastewater Treatment Plant Master Plan City of Reedley
Constituent	**Typical Concentration**
Methane	55 - 75%
Carbon Dioxide	25 - 45%
Hydrogen Sulfide	0.01 - 1.00%
Nitrogen	2 - 6%
Hydrogen	0.1 - 2.0%

For the anaerobic digestion process to be effective, the contents of the digesters should be maintained between 95 and 98 degrees F. A heating system is required to maintain the heat in the digesters. The digesters are heated by pumping the cold sludge from the digesters through a heat exchanger. Also passing through the heat exchanger is hot water, provided by boilers. The boilers are generally dual fuel, with the primary fuel source being the digester gas. The standby, or backup, fuel is usually propane or natural gas. The heat from the hot water is transferred to the sludge, which, in turn, heats the digesters. Any gas not used by the boilers is generally flared.

The recommended method of mixing the digesters is with chopper pumps. Each digester will require at least two pumps. Common design practice is to completely recirculate the contents of the digester at least once every 30 to 45 minutes, although turnover rates of 3 to 4 hours have also produced acceptable mixing results. The typical mixing energy required to achieve these turnover rates ranges from 0.50 to 1.00 hp per 1,000 ft^3.

The advantages and disadvantages of anaerobic digestion are outlined in Table 10.8.

Table 10.8	Advantages and Disadvantages of Anaerobic Digestion Wastewater Treatment Plant Master Plan City of Reedley
Advantages	**Disadvantages**
Small footprint for on-site treatment.	High potential for odors.
Reduces the volume of sludge to be dewatered and/or disposed of.	Class 'B' product has limited disposal options.
Produces a waste gas that can be used to heat the process	Increased operation and maintenance costs associated with additional facilities
	Aerobic sludge from extended aeration process is not ideally suited for anaerobic digestion.
	Poor public acceptance of biosolids quality.

10.3.2.2 Aerobic Digestion

Aerobic digestion is a solids stabilization process in which aerobic biological reactions destroy biologically degradable (volatile) organic compounds in thickened sludge. Aerobic stabilization is normally operated in a complete mix system in the endogenous phase of the cellular growth. During aerobic stabilization, aerobic and facultative organisms utilize the oxygen and obtain energy from available biodegradable organic matter, including cellular material in the thickened sludge.

After the WAS is thickened to approximately 4 percent solids, the sludge is aerated for an extended period of time in an open, unheated tank, using conventional air diffusers or surface aeration equipment in a continuous, complete-mix operation. Factors that must be considered in designing aerobic digesters include temperature, solids reduction, detention time, air requirements, and energy requirements for mixing.

Because digestion occurs in an open tank, the temperature of the aerobic digester is dependent upon weather conditions. For this reason, digesters must be designed to accommodate sludge stabilization and air supply requirements at varying degrees of operating temperatures.

The oxygen requirements of the cell tissue must be satisfied by the aeration process in aerobic digestion. The amount of oxygen required to effectively oxidize the cell tissue is about 2.3 lbs of oxygen per lb of VSS. However, a minimum of 1 mg/L residual oxygen should be maintained during operation. Typical design criteria for aerobic digestion are presented in Table 10.9.

Table 10.9 Design Criteria for Aerobic Digesters
Wastewater Treatment Plant Master Plan
Reedley, California

Parameter	Value
Hydraulic retention time, at about 20°C, d	12 - 18
Solids loading, lb VSS/ft^3-d	0.1 - 0.3
Oxygen requirements, lb O_2/lb solids destroyed	~ 2.3
Energy requirements for mixing with Diffused Air, ft^3/10^{3}ft^3-min	20 - 40
Dissolved-oxygen residual in liquid, mg/L	1 - 2
Reduction in volatile suspended solids, percent	40 - 50

Unlike anaerobic digestion, aerobic digestion does not produce a gas by-product for use to supplement its energy requirements. Due to the large amount of air necessary to supply the required oxygen, aerobic digestion requires continuous mixing for proper operation. Mixing power requirements should be evaluated to determine energy needs.

The long sludge age in oxidation ditch facilities reduces the volatile solids content of the sludge. Experience has shown there is very little additional volatile solids of oxidation ditch sludge in aerobic digesters. The advantages and disadvantages of aerobic digestion are outlined in Table 10.10.

Table 10.10 Advantages and Disadvantages of Aerobic Digestion
Wastewater Treatment Plant Master Plan
City of Reedley

Advantages	Disadvantages
Small footprint for on-site treatment.	Class 'B' product has limited disposal options.
Reduces the volume of sludge to be dewatered and or disposed of.	Increased Operation and Maintenance Costs associated with additional facilities.
Lower potential for odors than most other technologies	Poor Public Acceptance of Class 'B' biosolids.
	Oxidation Ditch sludge volume not significantly reduced.

10.3.3 Dewatered WAS to McCarthy Farms

In this scenario, the City would continue to dewater the WAS and truck the dewatered cake to the San Joaquin Composting Facility for further processing with ultimate land application at McCarthy Farms. To meet the year 2030 sludge production, additional WAS centrifuges would be required. Due to the limited space in the existing centrifuge building it is assumed that a new structure would be required. An ideal location for this new facility would be to the west of the existing centrifuge building. Located in this new building would be new centrifuges, polymer feed equipment, and truck loading facilities.

This process has a proven track record with the City. The current cost to the City to haul the dewatered biosolids to the San Joaquin Composting Facility is $37.75 per wet ton.

The operators have an understanding of the operation and maintenance routines associated with the centrifuge dewatering process. Expanding with additional similar equipment would result in a smaller learning curve for plant staff. Additionally, dewatering is usually required for both the Class 'A' and 'B' technologies. The dewatering of the WAS and removing it from the WWTP site produces few odors. The equipment and the haul trucks are housed in an enclosed building.

The advantages and disadvantages of dewatering the WAS and trucking it off-site for further treatment and land application are outlined in Table 10.11.

Table 10.11 Advantages and Disadvantages of Dewatering WAS and Off - Site Composting Wastewater Treatment Plant Master Plan City of Reedley	
Advantages	**Disadvantages**
Small footprint on the treatment site.	Limited disposal options.
Reduces the volume of sludge to be hauled offsite.	Two to five truck loads into and out of the site each week.
Potential for odors is minimized due to enclosed process and aerobic sludge.	
Can be used in conjunction with both Class ‘A’ and Class ‘B’ technologies as required in the future.	

10.4 RECOMMENDED BIOSOLIDS HANDLING

10.4.1 Recommended Biosolids Alternative

The trend in biosolids treatment and disposal in the State of California is toward Class ‘A’. At this time it is unclear what method or technology will become the preferred and most cost effective method of producing a Class ‘A’ biosolids. Once the biosolids regulations become less dynamic, the Class ‘A’ preferred options will become apparent. Regardless, heat drying and pelletization have certain benefits over the other identified Class ‘A’ options, primarily because the final product is very dry which results in a much smaller quantity of product to be transported. Heat drying and pelletization can be implemented at Reedley without the intermediate step of the Class ‘B’ process.

If the City were to produce a Class ‘B’ biosolids product they would need to find suitable agricultural land to apply it on. Currently the only county in the Central Valley that allows a Class ‘B’ biosolids product to be land applied is Merced County. Due to limited land for applying a Class ‘B’ biosolids, it is likely it would still be trucked to the San Joaquin Composting Facility and composted to a Class ‘A’ EQ product and be land applied. Adding the intermediate step of producing a Class ‘B’ biosolids product may not open up land application options and therefore does not appear to be economical.

From an O&M perspective producing either a Class ‘A’ or ‘B’ biosolids will require additional processes. These processes may include gas handling, blowers, new structures, mixing equipment, chemical feed equipment, heaters, boilers, and other machinery. Adding these processes would only increase the operations and maintenance costs of the facility. Additional training would likely be required along with the potential of additional operational staff requirements.

From a public acceptance perspective, any additional biosolids handling facilities added to the current processing runs the risk of creating odor and noise.

Due to the uncertainties associated with land application of biosolids in California and the Central Valley, it is recommended that the City take a wait-and-see attitude relating to biosolids stabilization. During this time it is recommended that the City continue to dewater the WAS and truck it to the San Joaquin Composting Facility for further processing. As regulations change and become less dynamic the City can re-evaluate their biosolids treatment options. Expanding the current operation presents the least risk since it can likely be incorporated into any future biosolids treatment process the City may engage.

Heat drying will likely be the preferred on-site biosolids treatment in the near future in the Central Valley. Centralized incineration facilities are being built elsewhere in the state and may be feasible in the future in the Valley. Reedley's expanded centrifuge dewatering facility can be used in conjunction with the heat drying or incineration processes. With heat drying or incineration, no additional or immediate step is required between the dewatering (centrifuges) and the heat drying or incineration process. Adopting this wait-and-see position will allow the City to easily incorporate heat drying or incineration when it becomes feasible and cost effective.

10.4.2 Design Parameters For WAS Dewatering

The WAS dewatering facility will be designed around the sludge production rates previously determined to be 1,200 dry lbs of WAS per MG on an AAD basis. The year 2030 WAS production is 7,236 dry lbs per day. The improvements would generally include an aerated sludge holding tank and an additional centrifuge facility. It is recommended that the improvements be designed and constructed such that they can be built in phases to allow the dewatering capacity to match the WAS production.

10.4.3 Aerated Sludge Holding Tank

In the current process configuration, the dewatered WAS is pumped directly from the RAS wetwell to the centrifuges. This sludge generally has a solids concentration of less than 1 percent (10,000 mg/L). Although the centrifuges can efficiently dewater WAS of this concentration, it may be beneficial to install an aerated sludge holding tank prior to the dewatering process.

The use of an aerated sludge holding tank would provide several benefits to the dewatering process. First, the aerated tank would provide a place for short-term storage. This storage is beneficial as it provides flexibility in both the WAS pumping schedule and dewatering schedule. For normal operation the holding tank would be aerated to minimize odors and to keep the WAS aerobic. The aerated storage tank would be outfitted with a decant system. To thicken the WAS, the aeration system would be shut down for an operator adjustable time to allow the solids to settle. As the solids settle and become thicker, the clear decant would be removed from the tank and delivered to the secondary treatment process for further treatment. At the end of the decant cycle the aeration system would be turned back on. At this time, the thickened WAS would then be pumped from the bottom of the tank to the dewatering centrifuges or additional WAS could be added. Based on a year 2030 sludge production of 7,236 dry lbs per day, the volume of WAS to be dewatered decreases as the concentration increases as shown in Table 10.12.

Table 10.12 Results of WAS Thickening of 7,236 Dry Pounds Per Day
Wastewater Treatment Plant Master Plan
City of Reedley

WAS Concentration	Volume to be Dewatered
1 percent WAS	86,739 gallons
1.5 percent WAS	57,826 gallons
2 percent WAS	43,370 gallons
2.5 percent WAS	34,696 gallons
3 percent WAS	28,913 gallons
3.5 percent WAS	24,783 gallons
4 percent WAS	21,685 gallons

As shown above thickening the WAS has a significant effect on the volume of WAS to be dewatered. For the purpose of this evaluation it is assumed that the WAS would be thickened to 1.5 percent. The actual concentration of the thickened WAS will vary depending on how long the settling period is and the actual settling characteristics of the WAS.

With the use of an aerated sludge holding tank, dedicated centrifuge feed pumps would be required. The centrifuge pumps would draw from the bottom of the aerated tank and pump the WAS directly to the dedicated centrifuge. These feed pumps would be located near the aerated sludge holding tank. The centrifuge feed pumps would direct the WAS to the online centrifuges. The use of VFD controls would provide the operations staff the flexibility to flow pace the polymer and WAS feed rates to optimize the dewatering process. In this operating scenario, it may be possible to locate centrifuge feed pumps near the aerated sludge holding tank.

For the purpose of this evaluation it is assumed that three days of storage would be provided. This would provide the needed storage to hold the WAS over a three-day holiday. Based on the design flow of 87,000 gpd, this results in an aerated sludge holding tank of 261,000 gallons. Making the assumption that the usable volume of the tank is 80 percent of the required volume results in an aerated sludge holding tank capacity of 326,250 gallons. The actual size and configuration of this tank will be finalized during the design process as desired by the City.

The aeration needs for an aerated sludge holding tank are between 20 and 50 ft^3 air/1000 ft^3-min of basin volume for diffused aeration. This results in aeration power requirements of 125 horsepower.

The opinion of probable capital costs for an aerated sludge holding tank are shown in Table 10.13 below.

Table 10.13 Probable Opinion of Estimated Capital Costs - Aerated Sludge Holding Tank
Wastewater Treatment Plant Master Plan
Reedley, California

Component	Estimated Costs
Aerated Holding Tank Structure	$200,000
Aeration Equipment	$150,000
Centrifuge Pump Structure	$150,000
Centrifuge Pumps	$150,000
Piping and Valving	$100,000
Misc. Equipment	$50,000
Misc. Metal	$25,000
Subtotal	$825,000
Site Work (10%)	$82,000
Electrical (20%)	$165,000
Instrumentation (5%)	$41,000
Coatings (2%)	$16,000
Estimated Sub-Total	$1,129,000
Estimating Contingencies (25%)	$282,000
Estimated Total	$1,411,000

10.4.4 Centrifuge Facility Improvements

It is envisioned that the existing centrifuge facility would operate in conjunction with the proposed treatment facility.

The WAS from the existing and proposed WAS pumps would be directed through in-line grinders to shred plastics and other trash prior to dewatering. After the sludge passes through the grinders, polymer would be injected into the WAS feed prior to the introduction into the centrifuges. The polymer aids in the liquid/solids separation process. The conditioned sludge would enter the online centrifuges where it would be subjected to centrifugal forces that separate the liquid from the solids. The dewatered cake would be pushed through the centrifuge where it would be dropped into a waiting truck in the truck-loading bay. The centrate or liquid portion of the WAS would then flow by gravity to a centrate pump station would will deliver it to the secondary treatment for further treatment.

It is important that the flow into each centrifuge is monitored so that the proper dose of polymer can be added to the WAS, and to keep an accurate inventory of how much WAS is being processed. These meters should be located on the individual piping that leads to each centrifuge. Mag meters to match the existing meters are recommended for this application.

Generally, the new centrifuge building would be similar to the existing building with a few modifications. The new centrifuge facility would incorporate a polymer feed system similar to the existing system. This system would be automated and would flow pace the polymer feed to the individual centrifuges based on operator selectable parameters. The polymer feed system should be located in an isolated room of the centrifuge facility. This room should equipped with a heating system to keep the polymer warm during the winter months, and ventilation to keep the room cool in the summer. Current practice is to receive the polymer in 55-gallon drums. It may be more advantageous to order the polymer in 300-gallon totes. Regardless of which system is used, spill containment should be incorporated to contain the polymer in the event a drum or tote fails. To allow the polymer to be delivered, this room should also have a rolling, or other style of door that is large enough to allow the totes to be moved into and out of the room. Due to the need for frequent polymer deliveries, this room should be located at the ground level.

Also located on ground level would be the truck loading bay. This bay would be large enough to allow a tractor-trailer combination to enter the facility and accept the dewatered cake. It is recommended that garage doors be located on each end of the truck bay. Ventilation may also be required in the truck bay.

The new centrifuges would be installed on the second floor. The centrifuges would be sized such that the year 2030 WAS production can be dewatered during a regular five-day work week in eight-hour shifts with one centrifuge out of service. Each centrifuge would incorporate a PLC based control panel which would control the WAS feed rate, the polymer feed rate, and monitor the functions of the centrifuge. These control panels would likely be housed in the same area as the centrifuges.

Centrifuges, control panels, and associated equipment are large and heavy. Being located on the second floor presents a unique situation. Provisions must be made to allow for the removal and maintenance of the equipment. To provide for the removal of the equipment an overhead crane could be furnished. An overhead crane could also be used for maintenance activities that include removing parts of the equipment for repairs. Another approach would be to provide removable skylights or panels above the centrifuges in the roof. In the event that a centrifuge needs to be removed, the skylight or panel would be removed and a crane would lift the centrifuge out of the room through the opening to a waiting truck. As part of this option a smaller, movable 'A' frame or similar hoist would be provided for smaller maintenance tasks. Regardless of which option is incorporated to allow the equipment to be lowered to the ground level, adequate access must be provided around and above the centrifuges to allow easy operation and maintenance.

The existing Sharples centrifuges are capable of dewatering 30 to 75 gallons per minute of WAS. Based on a year 2030 design WAS production of 7,236 lbs/day and a WAS concentration of 1.5 percent, equipment is required to dewater approximately 406,000 gallons of WAS per week. Based on a five-day work week and an 8-hour work shift results in a dewatering requirement of 10,150 gallons per hour or about 170 gpm. Based on the centrifuges operating at 50 gpm, a total of four centrifuges in operation plus one standby for a total of five is required. Of these five is units, two are existing and three are new units.

Another option would be to install fewer but larger centrifuges. This option would need to be closely evaluated to assure that proper WAS flow splitting between the smaller existing units and larger units is accomplished. For the purpose of this study it is assumed that three centrifuges of the same size and style would be installed. The actual size and style of equipment should be re-visited during final design.

It is recommended that the centrifuges be installed in phases. To accomplish this the new dewatering facility would be sized to house four new centrifuges, but only two would be installed. The third centrifuge would be installed as the WAS production increases. The fourth centrifuge would be installed if needed in the future.

The estimated costs for a dewatering facility that incorporates three new centrifuges of the same size as the existing is outlined in Table 10.14. It is recommended that this structure be sized to allow for the addition of more centrifuges if needed.

Table 10.14 Opinion of Probable Capital Costs - Centrifuge Facility
Wastewater Treatment Plant Master Plan
City of Reedley

Component	Estimated Costs
Centrifuge Building	$750,000
Centrifuges (total of 3)	$525,000
Grinders	$25,000
Polymer Feed Units	$50,000
Overhead Crane	$75,000
Piping	$50,000
Misc. Equipment	$50,000
Subtotal	$1,525,000
Site Work (10%)	$153,000
Electrical (20%)	$306,000

Table 10.14 Opinion of Probable Capital Costs - Centrifuge Facility
Wastewater Treatment Plant Master Plan
City of Reedley

Component	Estimated Costs
Instrumentation (5%)	$77,000
Coatings (2%)	$31,000
Estimated Sub-Total	$2,092,000
Estimating Contingencies (25%)	$523,000
Estimated Total	$2,615,000

SUPPORT FACILITIES

11.1 SUMMARY

Improvements that are needed in other areas of the treatment plant that are not specifically covered in the preceding chapters have been identified. These areas include the improvements and expansion of the scum beds, improvements to the existing RAS/WAS Pump Station, improvements to the non-potable water system, addition of a sodium hypochlorite system, enlarging the potable water system connection, miscellaneous improvements, new administration building, new shop, remodeling of the existing laboratory, additional percolation ponds, and demolition of Plants 1 and 2. The estimated cost for these improvements is $6,141,000. Without the percolation ponds, which are not needed until flows read 4.7 mgd, the total cost is $5,491,000.

11.2 SCUM BEDS

The scum and floatable material removed from the secondary clarifiers is pumped to scum beds for dewatering. The dewatering process occurs through solar drying and evaporation of the liquid in the scum. The dewatered scum is periodically removed from the scum beds and transported with the dewatered biosolids for further off-site treatment. As the plant capacity is increased, the scum beds should be expanded accordingly. There are a total of four (4) existing scum beds with a total area of 25,500 ft^2. Based on the existing MMAD flow of 3.0 mgd, it is estimated that 8,500 ft^2 of scum drying area is required per mgd of flow. Based on an MMAD flow of 6.9 mgd, a total of 58,650 ft^2, or an additional 33,150 ft^2, of drying area is required. Six (6) additional scum beds of the same size as the existing ones would be required to meet the scum from the projected year 2030 MMAD flows to the treatment plant. These can be built in the paved area adjacent to the existing scum beds. An option is to build a scum decant tank near the secondary clarifiers to reduce the volume of scum. A tank with scum skimming device would be required. This tank would be similar to an API oil skimming tank.

Other scum bed improvements identified in Section 7.5.11 include the addition of a decant system to aid in the drying process. The decant system would include valves and piping along the drying beds that would collect supernatant from the scum and direct it to a decant pumping station. This pumping station would return the supernatant back to the secondary treatment system for further treatment. The existing scum beds would need to be modified to include this new decant system.

The opinion of probable capital costs for the additional scum beds and decant system are shown in Table 11.1.

Table 11.1 Opinion of Probable Capital Costs - Scum Drying Beds Wastewater Treatment Plant Master Plan City of Reedley

Component	Estimated Costs
Scum Beds (33,150 ft^2 total)	$375,000
Decant Pumping Equipment	$75,000
Piping and Valving (Decant and Scum Discharge)	$50,000
Misc. Metal	$5,000
Subtotal	$505,000
Site Work (10%)	$51,000
Electrical (20%)	$100,000
Instrumentation (5%)	$25,000
Coatings (2%)	$10,000
Estimated Sub-Total	$691,000
Estimating Contingencies (25%)	$173,000
Estimated Total	$864,000

11.3 IMPROVEMENTS TO THE EXISTING RAS/WAS PUMP STATION

As discussed in Section 7.5.4.6, it is recommended that the existing RAS/WAS Pump Station be evaluated and reconditioned as needed. Such modifications to the RAS pumping system include replacement of the electrical-modulated control valves and flow meters on the RAS piping, and upgrading of the WAS piping and appurtenances. The existing centrifugal WAS pump should also be replaced with a progressive cavity pump, similar to the other two existing WAS pumps. The WAS pumps would continue to pump the WAS to the centrifuge facility previously discussed in Chapter 10. The new pump would increase the level of redundancy for WAS pumping operations in the event of equipment failure of the current pumps. In addition, this new pump could be utilized more efficiently in the scum pumping operations.

The following presents an opinion of probable capital costs for the items that have been identified for replacement during an initial inspection. Additional costs may be required after a more thorough inspection of the facility has been conducted.

Table 11.2 Opinion of Probable Capital Costs - RAS/WAS Pump Station Upgrades and Modifications Wastewater Treatment Plant Master Plan City of Reedley

Component	Estimated Costs
RAS Valves and Piping	$100,000
WAS Progressive Cavity Pump (7.5 HP)	$30,000
WAS Piping and Appurtenances	$20,000
Subtotal	$150,000
Site Work (10%)	$15,000
Electrical (20%)	$30,000
Instrumentation (5%)	$8,000
Coatings (2%)	$3,000
Estimated Sub-Total	$206,000
Estimating Contingencies (25%)	$52,000
Estimated Total	$258,000

11.4 NON-POTABLE WATER SYSTEM

As previously discussed in Section 7.5.12, the existing non-potable water pumps have been a source of recurring problems for plant staff. The split-case pumps have exceeded their useful life, creating issues of inadequate flow, low water pressure at the delivery points, downstream fouling, as well as the pumps losing their prime. Thus, the pumps will require replacement.

The current and planned uses for plant water include hose bibs and yard hydrants throughout the plant site. In addition to these, plant water would also be required at the Headworks Facilities for washing at the grit classifier, fluidization in the vortex grit removal tanks, and wash water for the bar screens. Non-potable water (NPW) would also be used at the clarifiers for surface spray water. Additionally, the City may irrigate landscaping with the NPW. The following table lists the estimated plant water supply demands for future use at the Reedley WWTP. Based upon these estimated usages, approximately 425 gallon per minute would be sufficient to meet the estimated peak demands.

Table 11.3	Proposed Future Non-Potable Water Usage Wastewater Treatment Plant Master Plan Reedley, California	
Process	**NPW Use**	**Peak Flow (gpm)**
Screenings Washer/Compactor	Wash Water	15
Grit Chamber	Fluidization	150
Grit Classifier	Wash Water	5
Clarifiers (5 total)	Surface Spray Water	50 (10 ea.)
Yard Hydrants (25 total, 2 in use)	Wash Water	40 (20 gpm ea.)
Hose Bibbs (25 total, 2 In use)	Wash Water	20 (10 gpm ea.)
Landscape	Irrigation	100
	Total	**425**

The new NPW pumps would be of the centrifugal type. Multiple pumping units should be provided to meet the varying demand and provide reliability and redundancy. A suction strainer should be installed on the inlet piping to the pumps to remove suspend material. To provide operating flexibility a hydropnuematic tank is recommended. To protect the pumping equipment from the elements it is recommended that they be enclosed. A suitable location for the NPW pumps to be located would be at the effluent pump station or the new RAS pump station, both of which are in close proximity to the clarified secondary effluent.

The opinion of probable cost for the upgraded non-potable water system is presented in Table 11.4.

Table 11.4	Opinion of Probable Capital Costs - Non-Potable Water System Wastewater Treatment Plant Master Plan City of Reedley
Component	**Estimated Costs**
NPW Pumps	$50,000
Associated Piping and Valves	$50,000
Hydropneumatic Tank	$50,000
Subtotal	$150,000
Site Work (10%)	$15,000
Electrical (20%)	$30,000
Instrumentation (5%)	$8,000
Coatings (2%)	$3,000
Estimated Sub-Total	$206,000

Table 11.4 Opinion of Probable Capital Costs - Non-Potable Water System Wastewater Treatment Plant Master Plan City of Reedley	
Component	**Estimated Costs**
Estimating Contingencies (25%)	$52,000
Estimated Total	$258,000

11.5 SODIUM HYPOCHLORITE SYSTEM

A sodium hypochlorite (NaOCl) system is recommended to be added to the site. This system would have two main purposes. The first would be to provide disinfection for the NPW system. The second would be to control algae in the secondary clarifier weirs and launders. Additional injection locations such as the RAS return lines may also be considered.

NaOCl is typically delivered in either bulk liquid and transferred to storage tanks, or in 300-gallon totes. Regardless of which method is used, the NaOCl should be protected from direct sunlight and freezing temperatures either under a canopy or in a building. Spill containment would be required. Commercially available NaOCl is generally 12 or 15 percent active. The liquid NaOCl is pumped through metering pumps at an operator selectable rate into the NPW system, secondary clarifier launders for algae control and other locations. The metering pumps and associated appurtenances should also be located inside of a building to protect them from the elements.

Based on a conservative NPW flow rate of 500 gpm, a 12 percent NaOCl concentration, and a feed rate of 10 mg/L as Cl2, would result in a daily NaOCl consumption of 72 gallons. Added to the NPW disinfection needs would be the NaOCl required to control the algae in the secondary clarifier launders and other uses. For planning purposes, it has been assumed that these other uses would require an additional 10 gallons per day. This would result in a daily NaOCl consumption rate of 82 gallons per day. Providing a minimum of 15-day storage would require approximately 1,250 gallons. To provide for reliability and redundancy it is recommended that two tanks, each 1,000 gallon minimum be supplied. This would allow a tank to be emptied and be out of service while the other tank provides storage. This volume is less than a full tank load, but in the Central Valley there are vendors who are willing to provide less than full loads to several users to keep the cost comparable to receiving full loads. Since the hypochlorite would begin to deteriorate after about two weeks, it is not recommended to have larger tanks to be able to receive full loads.

Chemical feed pumps would be required to deliver approximately 3.5 gallons per hour. To meet this feed rate, multiple pumps should be installed to provide reliability and redundancy.

The opinion of probable cost for the NaOCl feed system is shown in Table 11.5. This estimate assumes that the feed system would be installed in the same enclosure as the NPW pumps or another planned enclosure such as the new RAS pump station, therefore minimal building costs have been included in this estimate. This assumption will need to be confirmed during the design process.

Table 11.5 Opinion of Probable Capital Costs - NaOCl System
Wastewater Treatment Plant Master Plan
City of Reedley

Component	Estimated Costs
Building	$100,000
Storage Tanks	$50,000
Chemical Feed Pumps and Appurtenances	$50,000
Misc. Piping	$25,000
Subtotal	$225,000
Site Work (10%)	$23,000
Electrical (20%)	$45,000
Instrumentation (5%)	$11,000
Coatings (2%)	$5,000
Estimated Sub-Total	$309,000
Estimating Contingencies (25%)	$77,000
Estimated Total	$386,000

11.6 CITY WATER SUPPLY

The current City water service to the WWTP is supplied from the end of a 8-inch main through a two inch service connection. This service has inadequate flow and pressure for the needs and uses in the WWTP. It is recommended that a new water main be extended into the WWTP site. This water main should have the size and capacity required for fire flows. Consideration should be given to looping the new service with the existing for better delivery and pressure. The estimated cost for the new water service is $100,000 for about 1,800 feet of 6-inch water main.

11.7 NEW CONTROL / ADMINISTRATION BUILDING

An independent Administration and Controls Building is recommended as an addition to the treatment plant upgrades. The current facility is combined with the wastewater testing laboratory, and is of limited size and space. As regulatory requirements become more stringent, requiring more tests and analyses of wastewater samples, the laboratory will require supplemental testing equipment and additional space. As well, as projected flows are on the rise, additional staffing needs will develop. A larger and more state-of-the-art administrative facility will be needed to better suit the needs of the staff while providing them with a more comfortable work environment.

The new Administration and Controls Building should include such amenities as additional lockers and restrooms, a combination meeting/break room, kitchenette and storage rooms. A good location for this new facility would be on the north side of the site near Huntsman Avenue. The main access to the site should also be moved to the west side of the site with vehicular traffic being routed to the facility from Huntsman Avenue.

A typical administration with about four offices, a conference/training room, and the above mentioned amenities would require about 3,000 square feet. At a cost of $250 per square foot, the cost of a new administration building would be $750,000.

11.8 NEW SHOP BUILDING

It is also recommended that a new, larger shop building be constructed at the Reedley WWTP. The existing shop facility is combined with the facility that houses the plant's standby generator, and has limited capacity for properly servicing the large equipment items associated with treatment plant processes. A new, separate shop building could be constructed with additional room allocated as storage of staff vehicles and mobilization equipment. As well, a new design would allow for the incorporation of cranes, hoists and other lifting equipment in the shop facilities for easier handling of large equipment items during maintenance and repair. With the addition of a separate shop building, the current shop facility can easily be converted into storage space for various uses. The shop building should be large enough to house the new sewer maintenance vehicles including a vacuum trunk. The proposed location of this facility is near the proposed new Administration Facility on the north side of the site.

A typical maintenance building for the above mentioned uses would be about 4,000 square feet. It could be a pre-engineered metal building on a concrete pad. At a cost of $100 per square foot, the cost of a new maintenance building would be $400,000.

11.9 UPGRADED LABORATORY BUILDING

With the administration and control functions being planned to be relocated to the new Administration Building, the existing control and laboratory building should be rehabilitated and the laboratory area increased. The existing Controls/Laboratory Building could be converted to use solely as a laboratory, providing the additional room required for future testing needs, as well as an office for laboratory personnel. As previously shown in Figure 7.33, the existing building could be remodeled and expanded to expand the laboratory space and provide a separate break room and other facilities.

The extent of a remodel project is very difficult to estimate until detail plans and specifications have been prepared. However, a few years ago the Hanford WWTP laboratory was remodeled with the administrative offices being located in a new building. The cost of that project was approximately $375,000. For estimating purposes, it is assumed that the cost of the remodeling of the Reedley WWTP laboratory would be $400,000.

11.10 MISCELLANEOUS ELECTRICAL

As the various treatment facilities are added and upgraded, associated electrical requirements should be evaluated to determine if the current capacities can keep up with the new and future demands.

11.10.1 Standby Generator

The existing standby generator has a rating of 260 kW. The generator is powered by a Caterpillar 3406 diesel engine. The generator appears to be in good operating condition, however, it will not have the capacity to meet the planning period needs. Future power demands should be evaluated through the year 2030 upgrades to ensure that the facility has adequate backup energy provisions to power both the new and existing processes and equipment.

In addition to evaluating and upgrading the standby generators, the existing steel diesel fuels storage tank should be replaced with a double-contained fuel storage tank to prevent rusting and reduce maintenance requirements.

The opinion of probable costs for a larger standby generator is $500,000.

11.10.2 Electric Manhole

As previously identified in Chapter 7.4.15.2, the electrical manhole near the headworks is prone to flooding. It is recommended that the condition of the conduits and appurtenances in the manhole be determined. Improvement to minimize the flooding of this manhole should be included in the future project. Possible solutions to be considered include re-grading around the vault to allow the runoff to flow away from the vault, the installation of a waterproof cover, and the addition of a sump pump.

The opinion of probable costs for these improvements is $25,000.

11.10.3 RAS Pump Station

Plant staff has reported the occurrence of water draining from the RAS Pump Station electrical junction box. It is recommended that the electrical system for the pump station be evaluated for potential damage and useful life. For planning purposes, a probable opinion of estimated costs for this work is $50,000.

11.11 ADDITIONAL PERCOLATION PONDS

An additional 18 acres of percolation ponds will be required to handle the projected flows for the year 2030. However, these percolation ponds are not recommended to be constructed as part of the current project. They would be constructed later (see Chapter 5). A portion of existing Percolation Pond No. 1 would be filled for the new secondary clarifiers as part of the current project. When the additional percolation ponds are constructed, Pond No. 1 would be enlarged to include the field to the west. The orchard further west would be used for the remainder of the 18 acres of new percolation ponds. The estimated cost for the additional percolation ponds is $650,000. This cost is included in the total for the support facilities shown in Table 11.6.

11.12 DEMOLITION OF EXISTING FACILITIES

Both Plants Nos. 1 and 2 have been abandoned. As part of the recommended project these facilities would be demolished. Demolition of Plant No. 1 would include removal of the concrete Imhoff tank, spray field, digester, and clarifier/effluent pump station. Care will be required during the demolition of the Imhoff tank so as not to damage the operating headworks. Demolition will include both above ground and below ground portions of the the structures as well as mechanical debris that has accumulated in the area. The holes left from the demolition would be backfilled and graded to match surrounding area.

Plant No. 2 demolition would include demolition of concrete, mechanical and electrical facilities. Structures to be removed include the primary clarifier, trickling filter, and secondary clarifiers. Also included would be removal of liquid and solids waste in the structures. Electrical demolition would include removal of facilities back to the MCC cabinet within the digester (nonoperational) control building.

After the new headworks is constructed on the site of the Imhoff tank, the existing headworks would be demolished. Also, after the new effluent pump station is constructed, the existing screw pump station would be demolished.

The estimated cost for demolition of Plant No. 1, is $900,000. The estimated cost for demolition of Plant No. 2 is $200,000. The estimated cost for demolition of the headworks and effluent screw pump station is $500,000. These costs include contingency, contractor overhead and profit, and sales tax.

11.13 SUMMARY OF SUPPORT FACILITIES

The opinion of probable costs for the recommended support facilities improvements is shown in Table11.6.

Table 11.6 Opinion of Probable Capital Costs - Support Facilities
Wastewater Treatment Plant Master Plan
City of Reedley

Component	Estimated Costs
Scum Beds	$864,000
RAS/WAS Pump Station Improvements	$258,000
Non Potable Water System	$258,000
NaOCl Disinfection System	$386,000
New Administration Building	$750,000
New Shop Building	$400,000
Upgraded Laboratory Building	$400,000
Standby Generator Improvements	$500,000
Existing Electrical Manhole Improvements	$25,000
Electrical Panel in the RAS/WAS Pump Station	$50,000
Additional Percolation Ponds	$650,000
Demolition	$1,600,000
Estimated Total	$6,141,000

12.1 SUMMARY

Based upon the projected population and wastewater flows, it is recommended that the Reedley Wastewater Treatment Plant be expanded to handle 7.0 mgd. In addition, the treatment scheme is recommended to be upgraded to remove nitrogen so that the total nitrogen in the effluent will be below 10 mg/L. A preliminary site plan for the recommended project is shown in Figure 12.1. A summary of the design criteria for the recommended plant upgrades are shown in Table 12.1. The construction cost for the recommended project is estimated at $22,897,000, as shown in Table 12.2. The total project cost, after adding 35 percent for engineering, planning, inflation, administration, legal and contingencies is estimated at $31 million.

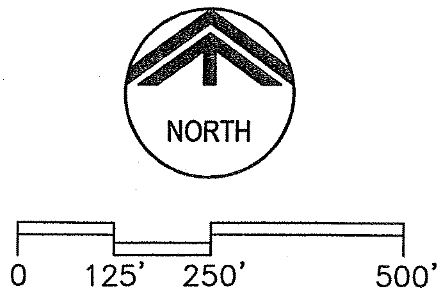
Based on wastewater flow projections, it is recommended that the City build this project in phases. The City should implement a 5.0 mgd Phase 1 Project, which would provide sufficient capacity through the year 2022. A preliminary site plan for the 5.0 mgd Phase 1 Project is shown in Figure 12.2. The construction cost for the Phase 1 Project is estimated at $18,538,000, as shown in Table 12.3. The total project cost, after adding 35 per cent for engineering, planning, inflation, administration, legal and contingencies is estimated at $25,026,300.

12.1.1 Preliminary Treatment Facilities

The recommended Preliminary Treatment Facilities include a new Headworks and a Vactor truck dump station. These facilities are sized based upon the projected flows for 2045. The peak hour flow for 2045 is projected to be 25.0 mgd. The Preliminary Treatment Facilities are briefly described below.

The Headworks would include two mechanical bar screens and a manual bypass bar screen. Each mechanical bar screen would be sized for 12.0 mgd, one half of the peak hour design flow. The approach channels would need to have air added to keep the suspended solids from settling. The screenings would be washed and compacted. The washing is to remove any fecal material that may have been removed and the compaction is to remove as much water as possible from the screenings. Influent sampling and flow metering would be located after screening.

The City is considering buying a Vactor Truck for sewer maintenance and cleaning. A dump station specifically designed for dumping of the contents from the Vactor Truck is included in the recommended project. The structure would include screens to remove any large debris in the water dumped from the truck.

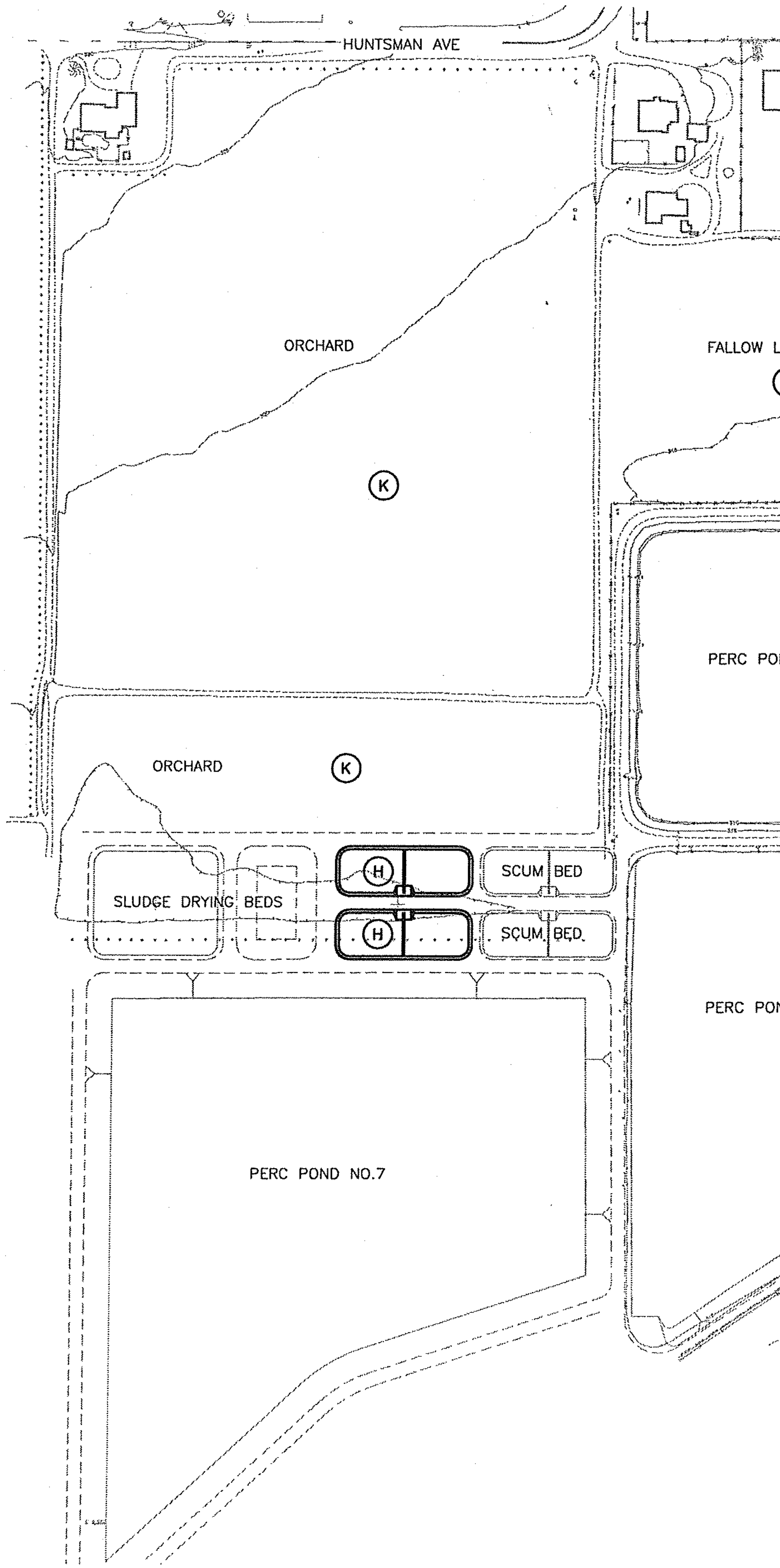


EXISTING FACILITIES

1. EFFLUENT PUMP STATION (DEMOLISH)
2. SECONDARY CLARIFIER (DEMOLISH)
3. TRICKLING FILTER (DEMOLISH)
4. PRIMARY CLARIFIER (DEMOLISH)
5. OPERATION BUILDING
6. DIGESTER, GENERATOR AND MAINTENANCE BLDG
7. HEADWORKS (DEMOLISH)
8. IMHOFF TANK (DEMOLISH)
9. OXIDATION DITCH (REHABILITATE)
10. FILTERED EFFLUENT PUMP STATION
11. CHLORINE MIXING BASIN
12. CHLORINATION/ DECHLORINATION BLDG
13. CHLORINE CONTACT BASINS
14. SLUDGE DEWATERING FACILITIES

RECOMENDED FACILITIES

- (A) HEADWORKS
- (B) GRIT CHAMBER (FUTURE)
- (C) SPLITTER BOX
- (D) OXIDATION DITCHES
- (E) SECONDARY CLARIFIERS (3)
- (F) RAS/WAS PUMP STATION
- (G) ADMINISTRATION BUILDING AND MAINTENANCE BUILDING
- (H) SCUM BEDS
- (I) CENTRIFUGE BUILDING
- (J) AERATED SLUDGE STORAGE TANK
- (K) PERCOLATION PONDS (FUTURE)
- (L) OXIDATION DITCHES (FUTURE)
- (M) SECONDARY CLARIFIERS (FUTURE)
- (N) EFFLUENT PUMP STATION
- (O) ANOXIC BASIN



Grit removal is not required for oxidation ditch facilities. If the City were to elect to include grit removal, the recommended grit removal process is a vortex grit removal chamber. A bypass channel would be provided for those periods when the vortex chamber is down for repair or cleaning. If the City desires, the grit removal process can be constructed as part of the project or at a latter date. The hydraulic profile will be designed for allow for the vortex grit removal chamber.

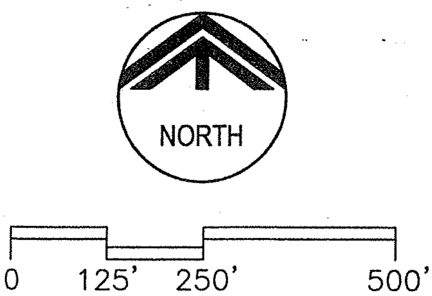
12.1.2 Secondary Treatment Facilities

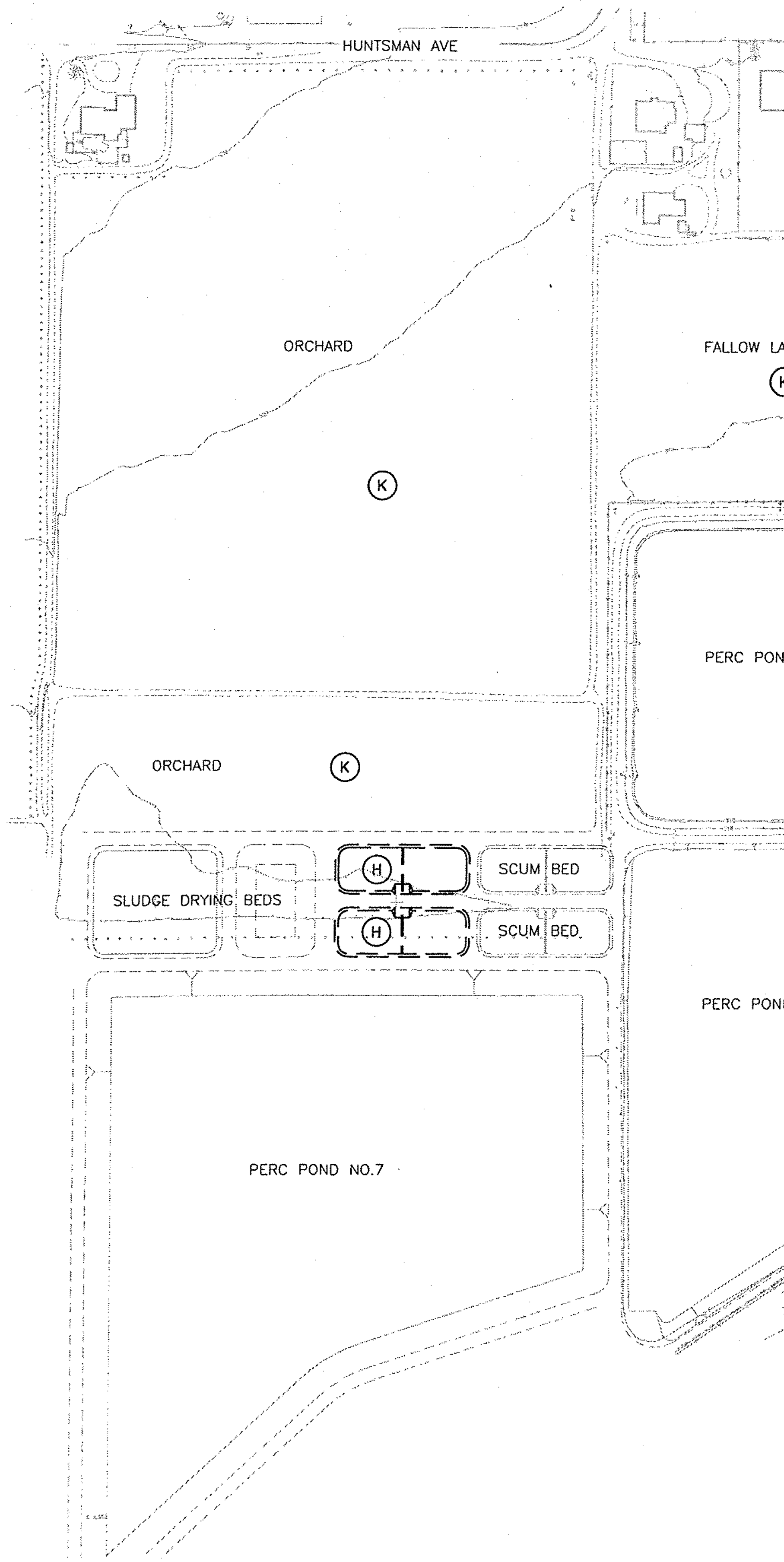
The recommended expansion of the secondary treatment portion of the plant is to add two 2.0 mgd oxidation ditches. These ditches would be constructed with anoxic chambers for denitrification. After the new ditches are operating, the existing oxidation ditch would be taken out of service and inspected. Needed repairs would be made. In addition, an anoxic basin would be constructed immediately upstream of the existing oxidation ditch. A new mixed liquor pump would be constructed to recycle oxidation ditch effluent back to the anoxic basin.

Table 12.1 Design Criteria for Recommended Project
Wastewater Treatment Plant Master Plan
City of Reedley

Component	Design Criteria
Annual Average Daily (AAD) Flow	6.03 mgd
Maximum Month Average Day (MMAD) Flow	6.88 mgd
Peak Hour (PH) Flow	15.08 mgd
PH Flow (2045)	25.00 mgd
MMAD BOD_5 Concentration	190 mg/L
MMAD BOD_5 Loading	10,902 ppd
MMAD TSS Concentration	220 mg/L
MMAD TSS Loading	12,623 ppd
Total Kjeldahl Nitrogen (TKN) Concentration	25 mg/L
TKN Loading	1,435 ppd

Three new secondary clarifiers are included in the recommended project. Each new clarifier would be 85 feet in diameter with 12-15 foot sidewater depths. Adding three secondary clarifiers to the two existing secondary clarifiers would allow one clarifier to be taken off-line without exceeding the hydraulic and solids loadings of the remaining clarifiers on line. As part of the recommended project, the existing secondary clarifiers would be taken out of service and inspected. Any needed repairs would be made.





EXISTING FACILITIES

1. EFFLUENT PUMP STATION (DEMOLISH)
2. SECONDARY CLARIFIER (DEMOLISH)
3. TRICKLING FILTER (DEMOLISH)
4. PRIMARY CLARIFIER (DEMOLISH)
5. OPERATION BUILDING
6. DIGESTER, GENERATOR AND MAINTENANCE BLDG
7. HEADWORKS (DEMOLISH)
8. IMHOFF TANK (DEMOLISH)
9. OXIDATION DITCH (REHABILITATE)
10. FILTERED EFFLUENT PUMP STATION
11. CHLORINE MIXING BASIN
12. CHLORINATION/ DECHLORINATION BLDG
13. CHLORINE CONTACT BASINS
14. SLUDGE DEWATERING FACILITIES

RECOMENDED FACILITIES

- (A) HEADWORKS
- (B) GRIT CHAMBER (FUTURE)
- (C) SPLITTER BOX
- (D) OXIDATION DITCHES
- (E) SECONDARY CLARIFIERS (3)
- (F) RAS/WAS PUMP STATION
- (G) ADMINISTRATION BUILDING AND MAINTENANCE BUILDING
- (H) SCUM BEDS (FUTURE)
- (I) CENTRIFUGE BUILDING
- (J) AERATED SLUDGE STORAGE TANK
- (K) PERCOLATION PONDS (FUTURE)
- (L) OXIDATION DITCHES (FUTURE)
- (M) SECONDARY CLARIFIERS (FUTURE)
- (N) EFFLUENT PUMP STATION
- (O) ANOXIC BASIN

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A new RAS/WAS Pump Station would be constructed to serve the new secondary clarifiers and new oxidation ditches. It is anticipated that there will be four RAS pumps each equipped with VFDs. In addition, four WAS pumps would also be provided.

A new Effluent Pump Station is included in the project. This pump station would replace the screw pump station. It is anticipated that this station would use four submersible pumps, sized to handle the 2030 peak hour flow of 15 mgd. A flow meter would be installed to monitor the effluent discharged to the percolation ponds. An automatic sampler would also be installed. The proposed location for the Effluent Pump Station is west of the new secondary clarifiers.

12.1.3 Biosolids Handling Facilities

The Reedley plant currently dewaters the WAS from the oxidation ditch process and transports the biosolids to the San Joaquin Composting Facility for composting. The compost is land applied at McCarthy Farms.

Due to the uncertainties associated with land application of biosolids in California and the Central Valley, it is recommended that the City of Reedley continue its current biosolids management by adding another centrifuge building. When the regulations become more settled, then the City can implement new and/or different technology if required.

12.1.4 Support Facilities

Improvements and expansion of some of the plant's support facilities are included in the recommended project. These include additional scum beds with a decant system, replacement of equipment in the RAS/WAS pump station, upgrades to the non-potable water system, increased capacity of the hypochlorite system, enlarged potable water line into plant, new Control/Administration Building, new shop building, upgraded laboratory, miscellaneous electrical improvement, and demolition of existing Plants 1 and 2. The miscellaneous electrical improvements would include a larger standby generator, modifications of the grading at the electrical pull box near the headworks, and sealing the junction box at the RAS Pump Station.

12.2 OPINION OF PROBABLE COST FOR RECOMMENDED PROJECT

The estimated cost for the recommended facilities for the current project is $22,997,000 as shown in Table 12.2. The costs of the vortex grit chamber and the additional percolation ponds are not included in this cost. If the vortex grit removal system is desired, an additional $873,000 would be required. When the additional percolation ponds are required, the additional cost is estimated to be $650,000. The total estimated capital cost for all facilities is $24,520,000.

12.2.1 Preliminary Treatment Facilities

The recommended headworks includes mechanical screens, screenings washer and compactor, influent sampling, and influent monitoring. The estimated cost for these facilities is $1,075,000. Grit removal is an optional process. The estimated cost for grit removal is $873,000. The cost for the Vactor truck dump station is $73,000. The estimated cost for the above preliminary treatment facilities without grit removal is $1,148,000.

12.2.2 Secondary Treatment Facilities

The estimated cost for additional secondary treatment facilities, including rehabilitation of the existing oxidation ditch and secondary clarifiers is $12,232,000.

Table 12.2 Opinion or Probable Construction Cost of Recommended Project
Wastewater Treatment Plant Master Plan
City of Reedley

Component	Cost
Headworks and Vactor Truck Dump Station	$1,148,000
Secondary Treatment Facilities	12,232,000
Biosolids Treatment	4,026,000
Support Facilities	5,491,000
Total Construction Cost	**$22,897,000**

12.2.3 Biosolids Handling Facilities

The modifications recommended for the biosolids handling facilities are additional centrifuges and an aerated sludge holding tank. The estimated cost for these improvements is $4,026,000.

12.2.4 Support Facilities

The estimated cost for the improvements to the plant support facilities is $5,491,000. The facilities include: the improvements and expansion of the scum beds, improvements to the existing RAS/WAS Pump Station, improvements to the non-potable water system, addition of a sodium hypochlorite system, enlarging the potable water system connection, miscellaneous improvements, new administration building, new shop, and remodeling of the existing laboratory. The cost does not include the cost of the additional percolation ponds. This cost is an additional $650,000.

12.3 PROJECT COST

It is recommended that the City add 35 percent to the construction cost listed in Table 12.2 to cover engineering services during design and inspection, planning, environmental documentation, inflation to mid-point of construction, administration, legal, and contingencies. The total Project cost is therefore estimated at $31 million.

12.4 RECOMMEDED "5 MGD PHASE 1" PROJECT

Based on wastewater flow projections, it is recommended that the City build this project in phases. The City should implement a 5.0 mgd Phase 1 Project, which would provide sufficient capacity through the year 2022. As flows approach 5.0 mgd, between the years of 2015 and 2020, the City would begin planning and designing the facilities to reach 7.0 mgd.

A preliminary site plan for the 5.0 mgd Phase 1 Project is shown in Figure 12.2. As shown in Figure 12.2, the principal difference between the 5.0 mgd Phase 1 Project and the 7.0 mgd Recommended Project is that only one of two oxidation ditches, and two of four secondary clarifiers will be constructed as part of the of the Phase 1 Project.

Table 12.3 provides a list of facilities that will be built in Phase 1. The table also itemizes the construction and project cost of each element. The construction cost for the Phase 1 Project is estimated at $18,538,000. The total project cost, after adding 35 percent for engineering, planning, inflation, administration, legal and contingencies is estimated at $25,026,300.

Table 12.3 5.0 mgd Phase 1 Project - Opinion of Probable Costs
Wastewater Treatment Plant Master Plan
City of Reedley

Item	5 mgd Project Construction Cost (1)	5 mgd Project Project Cost
10 mgd Headworks	$1,075,000	$1,451,250
Vactor Truck Dump Station	73,000	98,550
Secondary Treatment Flow Splitter Box	114,000	153,900
Oxidation Ditch	2,500,000	3,375,000
Existing Ditch Upgrades and Anoxic Basin	1,584,000	2,138,400
Mixed Liquor Splitter Box	114,000	153,900
Secondary Clarifiers Two New and Rehab Existing	2,900,000	3,915,000
RAS/WAS Pump Station	825,000	1,113,750
Effluent Pump Station	700,000	945,000
Aerated Sludge Holding Tank	1,411,000	1,904,850
Centrifuge Building	2,615,000	3,530,250
Existing RAS/WAS Pump Station Upgrades	258,000	348,300
Non-Potable Water System	258,000	348,300
Sodium Hypochlorite System	386,000	521,100
Administration Building	750,000	1,012,500
Maintenance Building	400,000	540,000
Administration/Laboratory Building Remodel	300,000	405,000
Standby Generator	500,000	675,000
Electrical Manhole near Headworks	25,000	33,750
RAS Pump Station Electrical Repairs	50,000	67,500
Demolition Plant No. 1	900,000	1,215,000
Demolition Plant No. 2	200,000	270,000
Demolition of Headworks and Effluent Pump Station	500,000	675,000
New Potable Water Supply	100,000	135,000
	$18,538,000	$25,026,300

(1) 2005 Construction Costs: Estimated bid price is $20 million, based on midpoint of construction. Construction cost escalation has been included in the Project cost.

APPENDIX A - WASTE DISCHARGE REQUIREMENTS ORDER NO. 5-01-257

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

SPECIAL ORDER NO. R5-03-

AMENDING WASTE DISCHARGE REQUIREMENTS
ORDER NO. 5-01-257
NPDES PERMIT NO. CA0081230

FOR

CITY OF REEDLEY
WASTEWATER TREATMENT FACILITY
FRESNO COUNTY

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

1. Waste Discharge Requirements Order No. 5-01-257 (NPDES Permit No. CA0081230) was adopted by the Regional Board on 7 December 2001, authorizing the City of Reedley (hereafter Discharger) to discharge 1.75 million gallons per day (mgd) of municipal wastewater from its wastewater treatment facility (WWTF) to the Kings River.

2. Provision J.12 of Order No. 5-01-257 requires the Discharger to submit, for Executive Officer approval, a written work plan in the form of a technical report that sets forth a schedule for a systematic and comprehensive technical evaluation of each major component of the WWTF's waste treatment and disposal systems. The technical report is to contain a preliminary evaluation of each component to determine best practicable treatment and control (BPTC) for each waste constituent and propose a time schedule for completing the comprehensive technical evaluation.

3. Provision J.13 of Order No. 5-01-257 requires the Discharger to submit, by the schedule approved by the Executive Officer pursuant to Provision J.12, but no later than 15 December 2004, the written comprehensive technical evaluation and written recommendations for WWTF modifications (e.g., component upgrade, retrofit, and disposal method).

4. Provision J.14 of Order No. 5-01-257 requires the Discharger to submit, by 15 December 2004, a technical report that proposes specific numeric groundwater limitations that reflect full implementation of BPTC, and specific supporting data, for Regional Board consideration.

5. Pursuant to Provision J.12 of Order No. 5-01-257, the Discharger, on 26 August 2002, submitted a *Work Plan for the Determination of BPTC (Non-Surface Water Discharge) August 2002* (hereafter Work Plan). Upon review, Regional Board staff requested revisions to the Work Plan by letter dated 1 May 2003. The Discharger submitted the revisions on 15 May 2003. The Regional Board Executive Officer subsequently approved the Work Plan on 1 July 2003.

6. Given the date of approval, and tasks involved in the Work Plan, the deadline of 15 December 2004 in Provisions J.13 and J.14 of Order No. 5-01-257 is no longer reasonable. The Work Plan schedule indicates that the Discharger requires 29 months to complete Provision J.13 and 28 months to complete Provision J.14. The Discharger requires additional time to contract the work and to allow the City to take advantage of laboratory cost savings by scheduling monitoring concurrently with

the monitoring and reporting program monitoring and has requested extension of the timelines until 1 March 2006 and 1 February 2006 to complete Provisions J.13 and J.14, respectively.

7. The Discharger and interested agencies and persons were notified of the Regional Board's intent to modify the dates in Provision J.13 and J.14 of Order No. 5-01-257 and provided an opportunity for a public hearing and to submit written views and recommendations.

8. In a public meeting on **16/17 October 2003**, all comments pertaining to the modification of the subject dates were heard and considered.

9. The action to amend Waste Discharge Requirements Order No. 5-01-257 is exempt from the provisions of Chapter 3 of the California Environmental Quality Act (CEQA) (Public Resources Code Section 21000 et seq.), in accordance with Section 13389 of the California Water Code.

IT IS HEREBY ORDERED, pursuant to sections 13263, 13267, and 13377 of the California Water Code, that Waste Discharge Requirements Order No. 5-01-257 is modified as follows:

Provision J.13: The "no later than" date of **15 December 2004** is extended to **1 March 2006.**

Provision J.14: The "by" **15 December 2004** date is extended to **1 February 2006.**

I, THOMAS R. PINKOS, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of a Special Order adopted by the California Regional Water Quality Control Board, Central Valley Region, on **DATE.**

THOMAS R. PINKOS, Executive Officer

jay:9/15/03

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. 5-01-257

NPDES NO. CA0081230

WASTE DISCHARGE REQUIREMENTS
FOR
CITY OF REEDLEY
WASTEWATER TREATMENT FACILITY
FRESNO COUNTY

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

1. The City of Reedley (hereafter Discharger or City) submitted a Report of Waste Discharge, dated 16 November 1999, and applied for a permit renewal to discharge waste under the National Pollutant Discharge Elimination System (NPDES) from the City's Wastewater Treatment Facility (WWTF or Facility). Supplemental information submitted on 15 February and 28 April 2000 completed the filing of the application.

2. The Discharger owns and operates a wastewater collection, treatment, and disposal system that serves industry and 20,940 city residents. The WWTF is on property owned by the Discharger in Sections 33 and 34, T15S, R23E, MDB&M, as shown on Attachment A, a part of this Order. Treated municipal wastewater is discharged to approximately 34 acres of ponds **(Discharge 001)** for final disposal by evaporation and percolation or to the Kings River **(Discharge 002)**, a water of the United States, at the point, latitude 36° 34'43" N and longitude 119°27'42" E.

3. The WWTF consists of headworks, an oxidation ditch, two secondary clarifiers, and a chlorination/dechlorination unit. Sludge is pumped from the secondary clarifiers through two dewatering centrifuge units into trucks and hauled off-site for use as a soil amendment. The centrate returns to the oxidation ditch for further treatment. Attachment B is a site plan that identifies the WWTF's features and Attachment C shows the process flow diagram, both a part of this Order. The WWTF, including the disposal ponds, is fenced to preclude public access.

4. Waste Discharge Requirements (WDRs) Order No. 95-110, adopted by the Board on 26 May 1995, governs the discharge of up to 3.5 million gallons per day (mgd) of WWTF effluent. The Order, an NPDES permit, would have expired on 26 May 2000, but was administratively extended by letter dated 9 May 2000, pending adoption of this Order. The purpose of this Order is to rescind the previous Order and update waste discharge requirements to ensure the discharge is consistent with Board plans and policies and to prescribe the requirements that are effective in protecting existing and potential beneficial uses of receiving waters.

5. The WWTF plant capacity of 3.5 mgd included an older plant (identified in Finding No. 4 of WDRs Order No. 95-110 as Plant No. 2) that consisted of a primary clarifier, high rate trickling filter, and secondary clarifier with a total capacity of 0.5 mgd. Plant No. 2 is currently not in service. The

present WWTF configuration (identified in Finding No. 4 of WDRs Order No. 95-110 as Plant No. 3) is indicated by Order No. 95-110 to have a maximum flow of 3.0 mgd. Daily average and maximum flows are 2.48 and 2.96 mgd, respectively, according to the Discharger's Report of Waste Discharge.

6. The Report of Waste Discharge describes the WWTF's influent flows as follows:

Constituent	Min. mg/L	Max. mg/L	Annual Average mg/L	Annual Average lb/day
BOD[1]	94	164	140	2,900
TSS[2]	148	213	190	3,900

[1] 5-day, 20°C biochemical oxygen demand
[2] Total suspended solids

7. The Discharger's monitoring reports for 2000 describe Discharge 001 as follows:

Constituent	Annual Average mg/L	lb/day	ml/L
BOD	2.8	57	---
TSS	5.2	106	---
Settleable Matter	---	---	0.14
Dissolved Oxygen	6.0	---	---
Total Nitrogen	11	225	---

8. The Discharger's annual effluent general mineral analysis for 2000 included the following results:

Constituent	Units	Quantity
TDS[1]	mg/L	470
EC[2]	µmhos/cm	617
Chloride	mg/L	58
Sodium	mg/L	81
Boron	mg/L	0.2
Copper	µg/L	10
Iron	µg/L	50

[1] Total dissolved solids
[2] Conductivity at 25°C

9. The Discharger's monitoring reports for 2000 indicate effluent total nitrogen concentrations ranging from 4.2 to 16.5 mg/L, with an average annual concentration of 11 mg/L (as indicated in Finding No. 7). The lower total nitrogen values occur in the spring to early summer and late fall months and indicate the potential for some denitrification in the treatment process. The higher values occur during the winter months and food processing season (summer months). Dependable denitrification may be possible with only slight modifications to the treatment and/or disposal process. Oxidation

ditch treatment can achieve high nitrogen removal efficiency if an anaerobic zone is maintained between aerators, according to the U.S. Environmental Protection Agency (EPA) manual *Wastewater Treatment/Disposal for Small Communities* (1992).

10. The Discharger's 2000 monitoring reports indicate a daily average inflow to the WWTF of 2.45 mgd, or about 82% of its 3 mgd capacity. The WWTF's daily average inflows for 1998 and 1999 were 2.26 and 2.48 mgd, respectively. Section B.5 of the Board's NPDES Standard Provisions and Reporting Requirements (Standard Provisions), dated 1 March 1991, requires the Discharger to estimate when inflows will exceed hydraulic and treatment capacities. Pursuant to Title 23, California Code of Regulations (CCR), section 2232, the Board conducted a straight-line projection of the WWTF's 1998, 1999, and 2000 inflows. The projection predicts the WWTF's inflow will exceed 3 mgd sometime in 2005. By letter dated 2 March 2001, the Board requested that the Discharger conduct the trend analysis pursuant to section B.5 of Standard Provisions. By letter dated 31 August 2001, the Discharger addressed capacity concerns and estimated the WWTF will require expansion by 2005. The letter included a memorandum from the Discharger's consulting engineer indicating that Plant No. 3 could process flows up to 3.5 mgd and, if necessary, all or portions of Plant No. 2 could be placed in service to ensure the discharge met all prescribed effluent limitations.

11. When the Discharger rehabilitates its ponds or when the ponds are at full capacity and there are sufficiently high flows in the Kings River, effluent is discharged directly to the river (Discharge 002). Chlorination/dechlorination takes place in a chlorine contact basin prior to the discharge. Reliable disinfection provided by the chlorination/dechlorination system is limited to a maximum flow of 1.75 mgd due to the contact time established by the size of the basin. Dechlorination achieved by the addition of sulfur dioxide occurs at the end of the basin. The outfall is through a 24-inch diameter pipe, which is generally submerged during favorable discharge conditions (dilution at least 100:1). The most recent discharge to the river occurred in 1998, from 13 April through 12 July. During this period, the average river flow was 5,850 cubic feet per second (cfs), and the minimum dilution was about 1,500:1. The river flows in the Reedley area are not gaged, but rather are a calculated summation of upstream flows and diversions. The Kings River Water Association keeps a detailed accounting of these values. Discharger monitoring in 1998 characterize Discharge 002 as follows:

Constituent	Annual Average mg/L	Annual Average lb/day
BOD	8.2	120
TSS	24.9	363
Dissolved Oxygen	9.5	
Chlorine Residual	0.02	0.3

12. Order No. 95-110 defined chronic toxicity as 70% minimum survival of any one bioassay or the median survival for any three or more consecutive bioassays to be less than 90%. Provision I.8 of the Order required the Discharger to implement an effluent toxicity monitoring program in accordance with procedures outlined in EPA 600/4-89-001 (*Short-Term Methods for Estimating the*

Chronic Toxicity of Effluent and Receiving Water to Freshwater Organisms). Effluent monitoring performed in 1998 by the Discharger indicated three-species survival in two bioassays, first in May and again in July.

13. The Discharger indicates the City does not have an active inflow and infiltration (I/I) monitoring and rehabilitation program. During periods of heavy storms, the WWTF inflows can increase over 50% for short durations. Inflows are generally greater during the summer months and peak in August, due primarily to seasonal food processing.

14. Source Water. The City obtains drinking water from a network of groundwater wells. In 1999, concentrations in the City's source water of total dissolved solids, conductivity at 25°C, hardness, and total alkalinity (as $CaCO_3$) averaged 304 mg/L, 408 μmhos/cm, 154 mg/L, and 164 mg/L, respectively. As indicated by the effluent EC in Finding No. 8, the EC of effluent exceeds that of source water by about 200 μmhos/cm.

Pretreatment Program

15. Order No. 95-110 required the Discharger to implement, as set forth in Title 40, Code of Federal Regulations (CFR), Part 403.5, the necessary legal authorities, programs, and controls to ensure that (1) incompatible wastes are not introduced to the treatment system (as defined in 40 CFR 405.5(b)), and (2) either alone or in conjunction with a discharge or discharges from other sources cause Pass Through or Interference.

16. The City's Municipal Code, Chapter 8, Title IX, implements its industrial pretreatment program. There are four industrial users permitted by the City: Guardian Industries (Guardian), SWF Companies (formerly Salwasser Manufacturing Company), Safety-Kleen, Inc.'s Reedley Recycle Center (Safety-Kleen), and Ito Packing Company Inc. (Ito).

17. Guardian manufactures glass mirrors, laminated glass, security glazed glass, and insulating glass. The plant has been operating in Reedley since 1974. The wastewater generated from such industrial processes may contain elevated concentrations of metals, particularly copper and silver. Guardian qualifies as a federal categorical industrial user pursuant to 40 CFR 433.15 (metal finishing existing sources prior to 1982). Accordingly, Guardian must comply with 40 CFR 403 and achieve prescribed technology based treatment standards.

18. SWF Companies primarily designs and manufactures automated corrugated box packaging machines. The machines take flat corrugated box material then fold, stock, and seal the boxes for shipping. As Salwasser Manufacturing Company, its operations in Reedley began over 40 years ago. It has been at its present location for about 20 years.

19. Safety-Kleen receives and processes wastes primarily from automotive repair shops, machine shops, and photo developers. It reclaims silver from photochemical wastes. It has been operating in Reedley since the 1970's. It has frequently violated its pretreatment limitations for boron, EC, and oil and grease. Safety-Kleen was responsible for seven incidents of solvent fumes at the WWTF.

The Discharger issued Safety-Kleen notices of violation for Safety-Kleen's noncompliance with pretreatment limitations. However, Safety-Kleen continued to violate the limitations for boron and EC until it began shipping its photochemical wastes off site in July 1999. This change decreased the average boron content of Safety-Kleen's discharge from nearly 30 to less than 0.1 mg/L, and decreased the discharger's average EC from 25,000 to 500 μmhos/cm. In January 2000, Safety-Kleen installed a plate coalescing oil/water separator in its waste treatment system and since late February 2000 has reduced the maximum oil and grease concentration in its discharge to the City's WWTF from over 1,000 to less than 100 mg/L, the local pretreatment limit.

20. Ito is one of the nation's largest fruit processing companies. Though it has obtained an IUP from the City, its discharge to the City's WWTF consists primarily of domestic sewage. Ito discharges its process wash water to on-site ponds. It discharges water used to keep refrigeration units defrosted to an adjacent canal.

21. The EPA and Board staff inspected Safety-Kleen and Guardian on 24 and 25 August 1999, respectively. According to the EPA's Safety-Kleen inspection report dated 6 March 2000, Safety-Kleen's industrial processes at the facility do not qualify it as a federal categorical industry.

22. The table below shows the City's Guardian industrial permit limits, the federal categorical metal finishing limits (40 CFR 433.15), and EPA's limits accounting for pipeline dilution by the combined waste stream formula in 40 CFR 403.6.

Constituent	Units	City's Limit	40 CFR 433.15	EPA
Cadmium	mg/L	---	0.69	0.49
Chromium	mg/L	---	2.77	1.96
Copper	mg/L	10	3.38	2.39
Lead	mg/L	---	0.69	0.49
Nickel	mg/L	---	3.98	2.81
Silver	mg/L	0.2	0.43	0.30
Zinc	mg/L	---	2.61	1.84
Cyanide	mg/L	---	1.20	0.85
TTO	mg/L	---	2.13	1.50
Iron	mg/L	30	---	---
Conductivity	mg/L	1000	---	---
Phosphorous	mg/L	20	---	---
Oil and Grease	mg/L	100	---	---
TSS	mg/L	300	---	---
BOD	mg/L	300	---	---
Boron	mg/L	0.7	---	---
Copper	lbs	4.25	---	---

NOTE: Missing values indicate no applicable limits

23. The City's industrial permit limits for each of its three other dischargers are similar to what the City imposed in Guardian's permit, as indicated in Finding No. 22. The City did not fully implement 40 CFR 433.15 in the Guardian permit.

Sludge Management and Biosolids Disposal

24. Sludge as used herein means the solid, semisolid, and liquid residues generated during the treatment of industrial and domestic sewage in a municipal WWTF. Sludge includes solids removed during primary, secondary, or advanced wastewater treatment processes, but not grit or screening material generated during preliminary treatment. Biosolids as used herein mean sludges that have undergone treatment and subsequently been tested and shown to be capable of being beneficially and legally used pursuant to federal and state regulations as a soil amendment for agriculture, silviculture, horticulture, and land reclamation.

25. General Biosolids Order. Pursuant to Section 13274 of the California Water Code, the State Water Resources Control Board adopted on 17 August 2000 Water Quality Order No. 2000-10-DWQ, *General Waste Discharge Requirements for the Discharge of Biosolids to Land for use as a Soil Amendment in Agricultural, Silvicultural, Horticultural, and Land Reclamation Activities* (hereafter General Biosolids Order).

26. Facility Sludge Handling. The sludge wasted from the two secondary clarifiers passes through two dewatering centrifuge units. The oxidation ditch receives the remaining sludge as return activated sludge. The oxidation ditch also receives the centrate from the two centrifuge units. The City produced approximately 630, 550 and 480 dry tons of biosolids in 1998, 1999 and 2000, respectively. The Discharger attributes the reduction in biosolids generation to improved ditch performance, including lower concentrations of filamentous organisms.

27. Historical sludge handling included discharge of sludge to unlined shallow drying beds and deeper storage lagoons; a practice conducted for over twenty years that has impacted shallow groundwater. The Discharger utilized the deeper sludge lagoons once the shallow drying beds were full. Following installation of the two centrifuge units in 1996, the Discharger installed new asphalt-lined shallow drying beds to further dry the sludge. The Discharger stockpiled dewatered biosolids onsite until disposed of by land application on local cropland. The Discharger discontinued use of the new beds due to nuisance odors and, since January 1998, has hauled all sludge off-site for disposal. The new asphalt-lined sludge drying beds currently serve as emergency storage only.

28. In September 1994, the Discharger collected soil samples from beneath the area of the sludge lagoons and sludge drying beds at two-foot intervals to 10 feet. The Discharger also collected two surface samples from an area west of the sludge lagoons where it temporarily stored biosolids. Soil sample analyses included pH, sodium, potassium, calcium, carbonate, bicarbonate, chloride, sulfate, nitrate, ammonia-nitrogen, total Kjeldahl nitrogen, EC, and cation exchange capacity. Results from the sludge lagoons and sludge drying beds were ambiguous, as nitrate concentrations decreased with depth in some borings with values that ranged from 152 to 10 mg/kg and increased with depth in others with values that ranged from 21 to 105 mg/kg. The surface samples from the biosolids

storage area indicated nitrate concentrations of 600 and 440 mg/kg. Overall, these areas are likely contributing sources of groundwater contamination.

29. In July 1997, the Discharger submitted a technical report, *City of Reedley Sludge Storage Site Nitrogen Levels Investigation and Closure Plan* (hereafter Closure Plan), prepared by Provost & Pritchard Engineering Group, Inc. The Closure Plan proposed measures to remediate nitrate contaminated soils, derived from storing pond bottom scrapings from 1992-1994, in a ½-acre area just west of the sludge drying beds by planting crops to uptake the nitrogen. The Closure Plan proposed monitoring the remediation progress with biannual soil sampling for nitrates.

30. The Board conditionally approved the Closure Plan in September 1997, and provided final approval by letter dated 27 October 1997, including approval of the Discharger's request to plant eucalyptus trees instead of annual crops. The Discharger implemented the Closure Plan by excavating the contaminated soils and placing them in the former sludge drying beds. The Discharger demolished the northernmost sludge drying beds and lagoons and filled them in with nitrate-contaminated soil from the old sludge storage area and with soils from the bottoms of some of the WWTF's ponds. The Discharger retained the southernmost drying beds and lagoon area for emergency sludge wasting sites.

31. In March 1998, the Discharger planted approximately 1,000 eucalyptus trees in the sludge drying area to uptake residual nitrogen, and conducted another round of soil analyses in April 1999. A 27 May 1999 inspection confirmed the eucalyptus planting and that the trees were about 2 feet tall and appeared healthy. A 17 January 2001 inspection revealed that the majority of the eucalyptus trees were dead and most of those remaining appeared stressed. The Discharger explained the damage as the result of an unavoidable disease effecting eucalyptus trees throughout the San Joaquin Valley.

32. Biosolids Disposal. In 2000, the Discharger hauled all biosolids generated at the WWTF off-site. The process involves dumping dewatered biosolids directly from the centrifuge units into truck beds hauled by Earthwise Organics to San Joaquin Compost Facility in Lost Hills, California, for composting and reclamation under the terms and conditions of WDRs Order No. 96-018.

Effluent Land Disposal and Reuse

33. Effluent Land Disposal Operations. In 1999, the Discharger began routine "deep ripping" the pond bottoms to six feet below ground surface. This practice greatly increases percolation, so that in 2000, the Discharger used only ponds 5 and 7 for effluent disposal, resulting in a hydraulic load of over 180 feet. The total area of the two ponds is approximately 14 acres.

34. Effluent Reuse. Order No. 95-110 required the Discharger to ultimately reclaim 30 percent of its discharge flow by 1 January 1998. The Discharger submitted a Reclamation Work Plan, dated 12 December 1995, indicating that management from both Alta and Consolidated Irrigation Districts are of the opinion that percolation is the most beneficial use of the WWTF's effluent. The Work Plan objectives included: (1) reduce the level of nitrates in groundwater to either the MCL of 10 mg/L or the background level, whichever is greatest; (2) minimize evaporation losses from the

ponds; (3) eliminate discharge to the Kings River; and (4) provide a buffer for pond capacity. The Discharger identified seven tasks to accomplish these goals, of which it only completed the first three. (The details of the Work Plan tasks are included in the Information Sheet). Currently, all effluent is discharged either to ponds or to the Kings River. The Discharger indicates that recent guidance from the California Department of Health Services, Food and Drug Branch, regarding the use of recycled water on orchard crops (described in Finding No. 35) has interrupted efforts to implement water recycling.

35. Title 22. The California Department of Health Services (DHS) established statewide water recycling criteria in Title 22, California Code of Regulations, section 60301 et seq. (hereafter Title 22). Revisions to the water recycling criteria in Title 22 became effective on 2 December 2000. The revised Title 22 requires that all recycled wastewater receive, at a minimum, secondary treatment. Title 22, section 60323, requires recyclers of treated municipal wastewater to submit an engineering report detailing the use of recycled water, contingency plans, and safeguards. The DHS has begun the process of developing regulations governing groundwater recharge with WWTF effluent. These proposed regulations, if promulgated, will require that the effluent be treated to control pathogenic microorganisms, total nitrogen, regulated contaminants (e.g., lead), and nonregulated contaminants (e.g., total organic carbon). Since the finalization of the revised Ttile 22 regulations, DHS Food and Drug Branch has indicated concern over the irrigation of orchard crops with municipal wastewater that does not meet the criteria of "disinfected tertiary recycled water," as defined by Title 22, section 60301.230. It has concerns that if the restrictions established for the use of lesser quality recycled water (Title 22 section 60304(d) are not fully complied with at all times, the food and seed crops irrigated with the recycled water may present a public health threat.

Hydrology and Land Use

36. The WWTF lies within the Tulare Lake Basin, specifically within Hydrologic Area No. 239, as depicted on interagency hydrologic maps prepared by the California Department of Water Resources (DWR) in 1986. Regional topography indicates a slope of about 1.3 feet per 1,000 feet toward the southwest. Locally, the WWTF site topography is influenced by the Kings River channel and slopes about 5.7 feet per 1,000 feet towards the southeast, towards the Kings River. The WWTF is adjacent to the right bank of the Kings River. Other surface waters include Consolidated Irrigation District's Smith Ferry Canal just north of the WWTF along Huntsman Avenue. This canal is piped in the vicinity of the WWTF. The other closest canal is Alta Irrigation District's West Reedley Ditch, east of the Kings River about ½ mile east of the WWTF.

37. The Kings River flows adjacent to the WWTF vary substantially throughout the year and from year to year. Flow data from the Kings River Conservation District for water years 1994/95 through 1999/00 (a water year is 1 October through 30 September the following year) indicate a minimum flow of 18 cubic feet per second (cfs) from 26 November through 14 December 1994 and a maximum flow of 8,567 cfs occurring on 12 July 1995. Pine Flat Dam and upstream diversions determine the flows past the WWTF. Except for flood releases, the flows meet irrigation demand of farmers in the Kings River service area. The Kings River provides generally exceptional quality water to the area farmers with very low hardness, measured in April and July 2001 at 65 and 7.5 mg/L, respectively.

38. The WWTF is predominantly outside of the 100-year flood hazard zone, according to maps published by the Federal Emergency Management Agency. A narrow strip of land parallel to the Kings River lies within a zone identified as either between the 100- and 500-year flood hazard zone or levee protected from a 100-year event. The Discharger indicates that it maintains the levee protecting the lower portion parallel to the Kings River. The upper portion that includes the office and treatment structures lies above the 500-year flood plain.

39. The WWTF is in a semiarid region. According to information published by DWR, the average annual precipitation is about 12 inches. The average reference evapotranspiration is about 51 inches, according to Title 23, CCR, section 495.

40. The soil types in the vicinity of the WWTF are Hanford fine sandy loam, Tujunga loamy sand, and Grangeville soils, according to the USDA Soil Conservation Service *Soil Survey of Eastern Fresno Area, California, 1971*. These soils are all derived from recent alluvium deposited on alluvial fans, or on channels, and generally lack or have weakly developed subsoils. Permeability is moderate to high. Drillers logs of the 14 monitoring wells installed to a maximum depth of 80 feet throughout the WWTF site indicate predominantly sandy soils to about 30 feet underlain by intermittent silty and clayey sands.

41. A water balance was performed to estimate the volume of effluent that percolated through the ponds for year 2000. The Discharger's routine pond maintenance program required only ponds 5 and 7, comprising 14.47 acres, for effluent disposal. The calculations used the average monthly wastewater flow into the Facility and the monthly total nitrogen values. The annual discharge from the Facility was 2,750 acre-feet over the 14.47 acres of percolation ponds. The ponds lost about 80 acre-feet to evaporation and percolated about 2,680 acre-feet to groundwater (assuming ponds continuously contained effluent). This equates to a percolation rate of 0.5 feet/day. Using monthly average effluent total nitrogen concentrations, this discharge results in a year 2000 nitrogen load of about 42 tons (or about 5,780 lbs/acre). If the effluent nitrate-nitrogen concentration were no greater than 10 mg/L (the maximum contaminant level, or MCL), the nitrogen loading would be about 4,660 lbs/acre/year. The excess 1,120 lbs/acre/year, if not attenuated in the soil profile, has a reasonable potential to pollute groundwater.

42. Land use in the vicinity is primarily agricultural with minor residential developments immediately to the north and northwest. The primary crops to the north, northwest, west, and southwest are peaches and nectarines (53% according to land use date published by DWR). There are no dairies or other similar confined animal feeding operations nearby the WWTF.

Groundwater Flow and Quality

43. Regional groundwater flows south-southwesterly and occurs about 40 feet below ground surface, according to information in *Lines of Equal Elevation of Water in Wells in Unconfined Aquifer*, published by DWR in Spring 1999.

44. Local Groundwater Conditions. Quarterly groundwater reports by the Discharger from 1999 to and including the first quarter 2001 indicate groundwater beneath the WWTF site varies from 15 to over

30 feet below site grade (bsg). This variation is due to surface relief rather than a steep groundwater gradient. Groundwater flows generally southeast towards the Kings River. Data from the early 1990s, the end of a six-year drought, indicated a northwesterly gradient away from the Kings River. The groundwater gradient shows mild seasonal fluctuations, likely due to effluent mounding from the ponds and effects from the various river stages. The regional groundwater conditions (i.e., wet or drought weather patterns) seem to have a stronger affect on the groundwater gradient. The WWTF effluent percolating through the ponds currently flows towards the river.

45. The Discharger installed 14 groundwater monitoring wells on and just north of the WWTF. These monitoring wells are identified as MW1-MW6, MW14-MW16, and MW18-MW22 and are shown on Attachment B, a part of this Order. The disconnected numbering is due to an overall numbering scheme that includes nearby domestic water supply wells. Order No. 95-110 requires the Discharger to perform quarterly monitoring of groundwater passing through the 14 monitoring wells for constituents that include general minerals, nutrients, coliform, and copper.

46. The Discharger initially installed monitoring wells MW1-MW6 to characterize the groundwater conditions beneath the WWTF site, but installed additional wells due to nitrate pollution found initially in wells MW1, MW2 and MW3. The Discharger has identified its former sludge drying beds and lagoons as the likely source of the nitrate pollution. The 1999 and 2000 quarterly monitoring reports indicate average nitrate (as N) concentrations in MW1, MW2, MW3, MW15, MW18, and MW21 of 17, 28, 28, 19, 12, and 19 mg/L, respectively, well above the MCL of 10 mg/L. All of these wells are near the north end of the WWTF, near the discontinued sludge drying operations.

47. The Discharger monitored six water supply wells in the WWTF vicinity and identified them as monitored supply wells SW8-SW13, as shown on Attachment D, a part of this order. The Discharger analyzed samples from the monitored supply wells once in 1993 and 1994, and quarterly in 1998. The data indicates that EC values ranged from 360 to 1,100 μmhos/cm, and averaged 560 μmhos/cm, and nitrate (as N) concentrations ranged from 6 to 25 mg/L, and averaged 10 mg/L, equal to the MCL. The maximum nitrate concentrations were detected in SW-12, which is about ¼ mile northwest of the former sludge drying beds.

48. Board staff inspected the WWTF on 17 January 2001. Conditions of noncompliance with the current Order resulted in the issuance of a Notice of Violation (NOV) dated 9 May 2001. The NOV requires the Discharger, in part, to address concerns beginning with the need for a comprehensive analysis of all groundwater data, a plan to determine the horizontal and vertical extent of groundwater nitrate pollution, and a remediation strategy with time schedule. The Discharger is also to evaluate the effectiveness of the soil remediation project in the former sludge drying beds and lagoons area and immediately continue with biannual soil sampling.

49. The Discharger submitted a technical report, *Groundwater Assessment Wastewater Treatment Facility* (GWA), dated August 2001 and prepared by Carollo Engineers and Kenneth D. Schmidt and Associates. The GWA evaluated existing groundwater data and identified monitoring wells MW-4, -5, -6, and -16 as being effluent dominated since their locations are adjacent to the disposal ponds. The GWA further stated that monitoring wells MW-1, -2, -3, and –21 are impacted from the

historical use of the unlined sludge drying beds and that the northern extent of nitrate pollution has not been defined. The GWA proposed pumping groundwater from wells MW-1 and MW-3 and discharging the extracted groundwater to the percolation ponds, increasing the resulting nitrate concentration in the discharge to the ponds by about 1.16 mg/L. While the GWA also indicates that analysis of soil sampled in April 2001 indicated low nitrate concentrations in all but one of the samples from beneath the "believed high nitrate" zone, it did not assess the soil remediation progress.

Basin Plan and Regulatory Considerations

50. The Board adopted a *Water Quality Control Plan for the Tulare Lake Basin, Second Edition,* (hereafter Basin Plan), which designates beneficial uses, establishes water quality objectives, and contains implementation plans and policies for waters of the Basin. The Basin Plan includes plans and policies of the State Water Resources Control Board incorporated by reference, pursuant to section 13263(a) and section 13377 of the California Water Code (CWC). These requirements implement the Basin Plan.

51. The Basin Plan designates existing and potential beneficial uses of the Kings River downstream of the discharge as municipal and domestic, industrial process, and agricultural supply; water contact and noncontact water recreation; warm fresh water habitat; wildlife habitat; and groundwater recharge. Flows in the river vary seasonally with low flows occurring in the winter (usually less than 100 cfs) and high flows occurring in the summer to meet irrigation demand (frequently greater than 1,500 cfs).

52. The Basin Plan designates existing and potential beneficial uses of area groundwater as municipal and domestic, agricultural, and industrial service and process supply.

53. Water in the Tulare Lake Basin is in short supply, requiring importation of surface waters from other parts of the State. The Basin Plan encourages reclamation on irrigated crops wherever feasible and indicates that discharges to surface water and evaporation of reclaimable wastewater will not be acceptable permanent disposal methods where the opportunity exists to replace an existing use or proposed use of fresh water with recycled water. Where appropriate, the Basin Plan allows a timetable for implementing reclamation.

54. The Basin Plan identifies the greatest long-term problem facing the entire Tulare Lake Basin as the increase in salinity in groundwater, which has accelerated due to the intensive use of soil and water resources by irrigated agriculture. The Basin Plan recognizes that degradation is unavoidable until a valley wide drain is constructed to carry salts out of the basin. Until the drain is available, the Basin Plan describes numerous salt management recommendations and requirements. The latter includes the requirement that discharges to land from wastewater treatment facilities not contain an EC greater than source water plus 500 μmhos/cm. Accordingly, the Basin Plan allows for salinity degradation and focuses on controlling the rate of increase. The Basin Plan limits discharges to areas that recharge to good quality groundwater to an EC of 1,000 μmhos/cm, a chloride concentration of 175 mg/L, and boron content of 1.0 mg/L.

55. In the process of crop irrigation, evaporation and crop transpiration remove water from and result in accumulation of residual salts in the soil root zone. These salts would retard or inhibit plant growth except for a fraction of irrigation water applied to leach the harmful salt from the root zone. The leached salts eventually enter ground water and concentrate above the uppermost layer of the uppermost aquifer. As this is the general condition throughout the agricultural Tulare Lake Basin, water supply wells for all beneficial uses are typically constructed to extract groundwater from below this level. Accordingly, compliance with the various water quality objectives necessary to protect beneficial uses within the vicinity of the discharge should be by means of wells extracting water representative of the depth of the uppermost zone.

56. Section 13050(h) of the California Water Code defines water quality objectives as "... the limits or levels of water quality constituents or characteristics which are established for the reasonable protection of beneficial uses of water or the prevention or nuisance within a specific area."

57. The Basin Plan establishes numerical and narrative water quality objectives for surface and groundwaters within the basin, and recognizes that water quality objectives are achieved primarily through the Board's adoption of waste discharge requirements and enforcement orders. Where numerical water quality objectives are listed, these are the limits necessary for the reasonable protection of beneficial uses of the water. Where compliance with narrative water quality objectives is required, the Board will, on a case-by-case basis, adopt numerical limitations in orders which will implement the narrative objectives to maintain existing and anticipated beneficial uses of waters in the area.

58. The Basin Plan identifies numerical water quality objectives for waters designated as municipal supply. These are the maximum contaminant levels (MCLs) specified in the following provisions of Title 22, California Code of Regulations: Tables 64431-A (Inorganic Chemicals) and 64431-B (Fluoride) of section 64431, Table 64444-A (Organic Chemicals) of section 64444, and Table 64449-A (Secondary Maximum Contaminant Levels-Consumer Acceptance Limits) and 64449-B (Secondary Maximum Contaminant Levels-Ranges) of section 64449. The Basin Plan's incorporation of these provisions by reference is prospective, and includes future changes to the incorporated provisions as the changes take effect. The Basin Plan requires the application of objectives more stringent than MCLs as necessary to ensure that waters do not contain chemical constituents in concentrations that adversely affect beneficial uses, whether the use is domestic drinking water supply, agricultural supply, or some other use.

59. The Basin Plan contains narrative water quality objectives for chemical constituents in and toxicity of groundwater that address constituents in the discharge that are potentially harmful to beneficial uses. The toxicity objective requires that groundwater be maintained free of toxic substances in concentrations that produce detrimental physiological responses in plants or animals. The chemical constituent objective states groundwater shall not contain chemical constituents in concentrations that adversely affect beneficial uses. Guidelines for identifying the quality of irrigation water necessary to sustain various crops were compiled by Ayers and Westcot in 1985 (*Food and Agriculture Organization of the United Nations — Irrigation Drainage Paper No. 29*). The Basin Plan recognizes these Guidelines for providing relevant numerical criteria to evaluate compliance with the previously described narrative water quality objectives. The Guidelines are intended for

use in estimating the potential hazards to crop production associated with long term use of the particular water being evaluated. The Guidelines divide water quality characteristics as having "No Problem – Increasing Problems – Severe Problems" based on large numbers of field studies and observations, and carefully controlled greenhouse and small plot research. In general, crops sensitive to sodium or chloride are most sensitive to foliar absorption from sprinkler applied water. Bicarbonate has been a problem when fruit crops or nursery crops are sprinkler irrigated during periods of very low humidity and high evaporation. The following table contains numerical criteria adapted from the Guidelines for protection of a range of crops under various circumstances, but the most stringent is not necessarily the concentration that assures no adverse affect on any nonagricultural beneficial use:

	Extent of Problem	
Problem and Related Constituent	No Problem	Increasing Problems
Salinity of irrigation water (EC, µmhos/cm)	< 700	700 – 3,000
Salinity of irrigation water (TDS, mg/L)*	< 450	450 – 1,800
Specific Ion Toxicity		
from ROOT absorption		
Sodium (mg/L)	< 69	69 – 207
Chloride (mg/L)	< 142	142 – 355
Boron (mg/L)	< 0.5	0.5 – 2.0
from FOLIAR absorption		
Sodium (mg/L)	< 69	> 69
Chloride (mg/L)	< 106	> 106
Miscellaneous		
NH_4-N (mg/L) (for sensitive crops)	< 5	5 – 30
NO_3-N (mg/L) (for sensitive crops)	< 5	5 – 30
HCO_3 (mg/L) (only with overhead sprinklers)	< 90	90 – 520
pH	normal range =	6.5 – 8.4

* Assumes an EC:TDS ratio of 0.6:1

60. The existing and anticipated beneficial uses of area groundwater for agricultural supply include irrigation of crops sensitive to salt and boron, though some protection is afforded by not sprinkler irrigating. Land use data compiled by DWR indicates a predominance of peaches and nectarines in the area with a few acres of citrus just north of the WWTF. Crops in the area are typically irrigated by flood or furrow irrigation systems that are less energy consumptive than pressurized sprinkler systems, according to the University of California Cooperative Extension. Based on climate, soil type, and water quality, other crops sensitive to salt and boron might be capable of being grown in the area, and changing market conditions could drive a change in cropping patterns, but neither is expected to necessitate greater protection than crops already identified.

61. According to the Guidelines, reductions in crop yields are not evident when irrigating stone fruit, almonds, and grapes with water having an EC of less than 1,000 µmhos/cm. The UC Cooperative Extension states that boron sensitive crops (e.g., plums and peaches) may show injury when irrigated with water with boron ranging from 0.5 to 1.0 mg/L and reductions in crop yields when irrigated with water with boron ranging from 1.0 to 2.0 mg/L. Bicarbonate has been a problem

when fruit crops or nursery crops are sprinkler irrigated during periods of very low humidity and high evaporation.

62. To maintain the beneficial uses of flood irrigation of crops sensitive to salt, it is necessary that area groundwater have EC values of 1,000 μmhos/cm or less, and low concentrations of salt, chloride, and sodium.

63. Sodium and chloride can cause foliar damage to crops that are sprinkler irrigated. Trees, vines, and woody species are the most susceptible. To protect crops near the WWTF that could be sprinkler irrigated (e.g., plums), the applied water should not contain values of sodium or chloride above 115 and 175 mg/L, respectively, according to *Agricultural Salinity Assessment and Management*, published by the American Society of Civil Engineers. Even though these values are higher than those recommended by the Guidelines (i.e., 69 mg/L for sodium and 106 mg/L for chloride), it is appropriate to consider them as water quality objectives and apply them as maximum possible groundwater limitations in this Order. Area crops predominantly do not include citrus, which is particularly sensitive to sodium and chloride, and the method of irrigation should adequately protect crops until additional information is collected that validates or amends this.

64. The numerical values reflect the highest tolerable level of quality necessary to sustain sprinkler application, as these are more restrictive than for flood irrigation. These objectives include EC (1,000 μmhos/cm), and the following expressed as mg/L: chloride (175), sodium (115), boron (0.7), and TDS (600). It is reasonable to conclude that the drinking water level of nitrate-nitrogen of 10 mg/L is adequately protective of existing and anticipated agricultural land uses. This Order implements a narrative groundwater water quality limitation for taste and odor by prescribing a groundwater limitation of 0.5 mg/L for ammonia. This concentration is based on a European Union drinking water standard. While not a DHS-promulgated Secondary MCL, the Board considered the European Union numerical limitation for ammonia for use as a taste-threshold value in drinking water, and finds its applicability to this discharge situation both relevant and appropriate. There are domestic wells in the area of the discharge. The groundwater ammonia limitation is protective of the beneficial uses of area groundwater for domestic supply.

65. In the process of crop irrigation, evaporation and crop transpiration remove water from and result in accumulation of residual salts in the soil root zone. These salts would retard or inhibit plant growth except for a fraction of irrigation water applied to leach the harmful salt from the root zone. The leached salts eventually enter ground water and concentrate above the uppermost layer of the uppermost aquifer. As this is the general condition throughout the agricultural Tulare Lake Basin, water supply wells for all beneficial uses typically are constructed to extract groundwater from below this level.

66. Infiltration from wastewater disposal ponds results in wastewater intersecting and accumulating on and in the uppermost layer of the uppermost groundwater until dispersed horizontally and vertically into the main mass of the aquifer. Compliance with the various water quality objectives necessary to protect present and future beneficial uses within the aquifer should be determined by water representative of the depth of the uppermost zones. Site-specific studies to determine the appropriate zones and geographical locations should be conducted by the Discharger subject to Executive Officer approval.

67. The use of municipal wastewater for irrigation at agronomic rates will have a comparable impact on groundwater as fresh water extracted and used for irrigation of the same crop with separate wastewater infiltration. Beneficial reuse of wastewater conserves freshwater resources and is encouraged by the Basin Plan and agronomic application rates of wastewater cause comparable impact as widespread freshwater irrigation practices. Accordingly, benefits of groundwater monitoring in wastewater reuse areas do not justify the cost, provided the rates of wastewater applications do not exceed reasonable agronomic rates.

68. California Department of Water Resources standards for the construction and destruction of groundwater wells (hereafter DWR Well Standards), as described in *California Well Standards Bulletin 74-90* (June 1991) and *Water Well Standards: State of California Bulletin 94-81* (December 1981), and any more stringent standards adopted by the Discharger or county pursuant to CWC section 13801, apply to all monitoring wells.

69. The U.S. Environmental Protection Agency (EPA) and the Board have classified this discharge as a major discharge.

70. Effluent limitations, and toxic and pretreatment effluent standards established pursuant to sections 301 (Effluent Limitations), 302 (Water Quality Related Effluent Limitations), 304 (Information and Guidelines), and 307 (Toxic and Pretreatment Effluent Standards) of the Clean Water Act [Title 33, United States Code (U.S.C.) 1251, 1312, 1311, and 1317, respectively], and amendments thereto are applicable to the discharge.

71. The EPA promulgated the *National Toxics Rule* (NTR) on 5 February 1993 and the *California Toxics Rule* (CTR) on 18 May 2000. These Rules contain water quality standards applicable to this discharge. The State Water Resources Control Board adopted the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (hereafter referred to as the State Implementation Plan or ISWP) that contains guidance on the implementation of the National Toxic Rule and the California Toxics Rule. Federal regulations require effluent limitations for all pollutants that are or may be discharged at a level that will cause or have the reasonable potential to cause, or contribute to an in-stream excursion above a narrative or numerical water quality standard. This Order contains provisions that:

    a. Require the Discharger to provide information as to whether the levels of EPA Priority Pollutants and NTR and CTR constituents in the discharge cause or contribute to an in-stream excursion above a water quality objective, including sampling for 2,3,7,8-TCDD and congeners;

    b. Require the Discharger to submit information to calculate effluent limitations for those constituents if the discharge has a reasonable potential to cause or contribute to an in-stream excursion above a water quality objective; and

    c. Allow the Board to reopen this Order and include effluent limitations for these constituents.

72. Pursuant to section 13267 of the California Water Code, the Board implemented the monitoring requirements of CTR by letter dated 27 February 2001. The letter requires the Discharger to analyze its discharge and the receiving water upstream of its discharge (1) quarterly for priority

pollutants with the final sample to be collected in January 2002 and (2) semiannually for organophosphate pesticides in April and October 2001. The letter also requires the Discharger to conduct 2,3,7,8-TCDD and congeners monitoring twice annually (wet and dry season) for the next three years, reporting the final sampling no later than 1 March 2004. To date, the Discharger has submitted two complete priority pollutant scans. The results indicate that, because of the extremely low hardness of river water (as described in Finding No. 37), there is a potential for copper and lead toxicity in both the river and discharge. However, additional data are necessary to perform a reasonable potential analysis.

73. Federal regulations require effluent limitations for all pollutants that may be discharged at a concentration that will cause or have the reasonable potential to cause or contribute to an in-stream excursion that exceeds a narrative or numerical water quality standard. This Order and the Basin Plan prohibit the discharge of toxic constituents in toxic amounts. In the event the dechlorinating unit is not functioning properly, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above a water quality objective for toxicity caused by residual chlorine. This Order includes, using the basis described in the Information Sheet, numerical effluent limitations for acute toxicity, residual chlorine, and numerical receiving water limitations for toxicity.

74. There are indications that the discharge may contain constituents that have a reasonable potential to cause or contribute to an exceedance of water quality objectives for EPA Priority Pollutants, National Toxics Rule constituents, and California Toxics Rule constituents.

Degradation

75. State Water Resources Control Board (SWRCB) Resolution No. 68-16 (hereafter Resolution 68-16 or the "Antidegradation" Policy) requires the Board in regulating the discharge of waste to maintain high quality waters of the state until it is demonstrated that any change in quality will be consistent with maximum benefit to the people of the State, will not unreasonably affect beneficial uses, and will not result in water quality less than that described in the Board's policies (e.g., quality that exceeds water quality objectives).

76. The Board finds that some degradation of groundwater beneath the WWTF and reclamation and disposal areas is consistent with Resolution 68-16 provided that:

- the degradation is confined to a specified area
- the discharger minimizes the degradation by fully implementing, regularly maintaining, and optimally operating best practicable treatment and control (BPTC) measures
- the degradation is limited to waste constituents typically encountered in municipal wastewater as specified in the groundwater limitations in this Order
- the degradation does not result in water quality less than that prescribed in the Basin Plan

77. Some degradation of groundwater by some of the typical waste constituents released with discharge from a municipal wastewater utility after effective source control, treatment, and control is

consistent with maximum benefit to the people of California. The technology, energy, and waste management advantages of municipal utility service far exceed any benefits derived from a community otherwise reliant on numerous concentrated individual wastewater systems, and the impact on water quality will be substantially less. Degradation of groundwater by constituents (e.g., toxic chemicals) other than those specified in the groundwater limitations in this Order, and by constituents that can be effectively removed by conventional treatment (e.g., BOD, total coliform organisms) is prohibited. When allowed, the degree of degradation allowed depends upon many factors (i.e., background water quality, the waste constituent, the beneficial uses and most stringent water quality objective, source control measures, waste constituent treatability).

Treatment and Control Practice

78. The WWTF described in Finding Nos. 3 and 5 provides treatment and control of the discharge that incorporates:

- technology for secondary treatment of municipal wastewater
- mechanical sludge dewatering
- biosolids handling and treatment for reuse
- effluent disinfection when discharge is to the river
- concrete treatment structures
- pretreatment permits for significant industrial users
- a capital recovery fund
- an operation and maintenance (O&M) manual
- staffing to assure proper operation and maintenance

79. The Discharger disposes of a majority of its effluent by discharging to highly permeable ponds adjacent to the Kings River. The percolation rate derived from recent pond operations (see Finding No. 41) is about ½ foot/day. Percolation of effluent with nitrogen concentrations exceeding 10 mg/L may unreasonably degrade groundwater if the nitrogen is not attenuated in the soil profile. Further, past on-site sludge handling practices have caused or contribute to groundwater pollution with nitrates and other waste constituents. The Discharger has initiated a remediation program through the planting of eucalyptus trees but has not fully remediated the source of nitrate contamination. Groundwater typically flows towards the river, but under certain conditions (e.g., due to drought and extensive pumping, or high river stages), groundwater occasionally reverses flow away from the river and towards the source of nitrate contamination. Because groundwater does not always flow towards the river, this method of disposal results in concentrated loadings to groundwater of nutrients, salts, and other waste constituents. While the Discharger has been monitoring the uppermost layer of the upper groundwater in a network comprised of fourteen wells beginning in 1992, the existing impacts on area groundwater and the appropriate level of degradation that complies with Resolution 68-16 have not been evaluated.

80. This Order establishes schedules of tasks to evaluate BPTC for each treatment, storage, and disposal component of the WWTF and to characterize groundwater for all waste constituents.

81. This Order establishes groundwater limitations that will not unreasonably threaten present and anticipated beneficial uses or result in groundwater quality that exceeds water quality objectives set forth in the Basin Plan. This Order contains tasks for assuring that BPTC and the highest water quality consistent with the maximum benefit to the people of the State will be achieved. Accordingly, the discharge is consistent with the antidegradation provisions of Resolution 68-16. Based on the results of the scheduled tasks, the Board may reopen this Order to reconsider groundwater limitations and other requirements to comply with Resolution 68-16.

82. The Board will consider a separate enforcement action to prescribe tasks and implementation schedules that require the Discharger to address soil contamination and groundwater pollution caused by past sludge handling operations.

83. Pursuant to CWC section 13263(g), discharge is a privilege, not a right, and adoption of this Order does not create a vested right to continue the discharge.

84. The action to adopt an NPDES permit is exempt from the provisions of Chapter 3 of the California Environmental Quality Act (CEQA) (Public Resources Code section 21000 et seq.), in accordance with section 13389 of the California Water Code.

General Findings

85. Section 13267(b)(1), CWC, provides that in conducting an investigation specified in subdivision (a), the regional board may require that any person who has discharged, discharges or is suspected of discharging, or who proposes to discharge waste within its region, shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the report and the benefits to be obtained from the reports.

86. The State Water Resources Control Board adopted the General Industrial Activities Storm Water Permit (General Permit) on 19 November 1991, and amended it on 17 September 1992 and 17 April 1997. The General Permit prescribes waste discharge requirements for discharges of storm water associated with industrial activities, excluding construction activities, and requires submittal of a Notice of Intent by industries to be covered under the permit.

87. The Discharger is not required to obtain coverage under a National Pollutant Discharge Elimination System General Industrial Storm Water Permit because all storm water runoff is retained on-site, and does not discharge to a water of the United States.

88. The discharge authorized herein and the treatment and storage facilities associated with the discharge, except for discharges of residual sludge and solid waste, are exempt from the requirements of Title 27, CCR, section 20380 et seq. (hereafter Title 27). The exemption, pursuant to Title 27 CCR section 20090(a), is based on the following:

a. The waste consists primarily of domestic sewage and treated effluent;

b. The waste discharge requirements are consistent with water quality objectives; and

c. The treatment and storage facilities described herein are associated with a municipal wastewater treatment plant.

89. State regulations pertaining to water quality monitoring for waste management units are found in Title 27, CCR, section 20380 et seq., (hereafter Title 27). These regulations prescribe procedures for detecting and characterizing the impact of waste constituents on groundwater. While the WWTF is exempt from Title 27, the data analysis methods of Title 27 may be appropriate in some ways to determine whether the discharge complies with the terms for protection of groundwater specified in this Order.

90. The Board considered the supplemental data and information in the Information Sheet in making findings and terms, and adopting conditions of this Order, and attaches it as part of this Order as documentation.

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

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

93. This Order shall serve as waste discharge requirements pursuant to section 13263 of the CWC relative to any discharge of waste to land and serve as an NPDES permit relative to any discharge of pollutants to surface water pursuant to section 13377 of the CWC and section 402 of the CWA [Title 33, U.S.C. 1342(a)], and amendments thereto. Authorization for discharge shall take effect upon the date of adoption for both types of discharge unless EPA registers objections regarding surface water discharge.

IT IS HEREBY ORDERED, pursuant to sections 13263, 13267, and 13377 of the California Water Code, that Waste Discharge Requirements Order No. 95-110 is rescinded and the City of Reedley, its agents, successors and assigns, in order to meet the provisions contained in Division 7 of the California Water Code and regulations adopted thereunder, and the provisions of the CWA and regulations and guidelines adopted thereunder, shall comply with the following at the City Wastewater Treatment Facility:

A. Discharge Prohibitions

1. Discharge of treated wastewater at a location or in a manner different from that described in Finding Nos. 2 and 3 is prohibited.

2. The by-pass or overflow of wastes is prohibited, except as allowed by Standard Provision A.13.

3. Discharge of waste classified as 'hazardous' as defined in section 2521(a) of Title 23, CCR, section 2510 et seq., or 'designated' as defined in section 13173 of the California Water Code, is prohibited.

4. Recycling of effluent to areas lacking either Board-adopted water reclamation requirements or waiver of said requirements is prohibited.

5. Discharge 002 is prohibited if the ratio of Kings River water to wastewater is less than 100:1.

B. General Discharge Specifications

1. The monthly average discharge flow shall not exceed 3.5 mgd.

2. The treatment, storage, and disposal facilities shall be designed, constructed, operated, and maintained to prevent inundation or washout due to floods with a 100-year return frequency.

3. The monthly average EC of the discharge shall not exceed the average EC of the source water plus 500 µmhos/cm, or a total of 1,000 µmhos/cm, whichever is less. Where multiple sources are used, the EC of the source water shall be determined as a flow-weighted average.

4. Objectionable odors originating at the WWTF shall not be perceivable beyond the limits of the wastewater treatment and storage area at an intensity that creates or threatens to create nuisance conditions.

5. The Discharger shall preclude public access to the treatment and effluent disposal facilities through methods such as fences, signs, or other acceptable means.

6. No waste constituent shall be released or discharged, or placed where it will be released or discharged, in a concentration or in a mass that causes violation of Groundwater Limitations.

C. Land Discharge Specifications (Discharge 001)

1. The discharge to the disposal ponds (Discharge 001) shall not exceed the following limitations:

Constituents	Units	Monthly Average	Daily Maximum
BOD_5[1]	mg/L	40	80
Total Suspended Solids	mg/L	40	80
~~Settleable Sol~~ids	ml/L	0.2	0.5

[1] Five-day, 20°C Celsius biochemical oxygen demand

2. The arithmetic mean of BOD_5 and of total suspended solids in Discharge 001 samples collected over a monthly period shall not exceed 20 percent of the arithmetic mean of the

values for influent samples collected at approximately the same times during the same period (80 percent removal).

3. Discharge 001 shall not have a pH be less than 6.5 or greater than 9.5.

4. As a means of discerning compliance with General Discharge Specification B.4, the dissolved oxygen content in the upper zone (one foot) of wastewater in all ponds shall not be less than 1.0 mg/L.

5. Ponds shall be managed to prevent breeding of mosquitoes. In particular:

   a. An erosion control plan should assure that small coves and irregularities are not created around the perimeter of the water surface.

   b. Weeds shall be minimized through control of water depth, harvesting, and herbicides.

   c. Dead algae, vegetation, and debris shall not accumulate on the water surface.

   d. Vegetation management operations in areas where birds have been observed nesting shall be carried out either before or after, but not during, the **April 1** to **June 30** bird nesting season.

6. Freeboard shall never be less than two feet in any pond (measured vertically from the lowest elevation of the pond embankment).

7. As a means of discerning compliance with Discharge 001 Specification C.6, the Discharger shall install and maintain in each pond permanent markers with calibration indicating the water level at design capacity and available operational freeboard. Upon the Discharger's written request, specific WWTF ponds may be exempt from this requirement. Such exemptions shall be subject to the Executive Officer's written approval.

D. River Discharge Specifications (Discharge 002)

1. **Until Provision J.19 is satisfied,** the monthly average Discharge 002 flow shall not exceed 1.75 mgd.

2. The discharge to the Kings River (Discharge 002) shall not exceed the following limitations:

Constituents	Units	Monthly Average	Weekly Average	7-Day Median	Daily Maximum
BOD_5	mg/L	10	15	--	30
	lbs/day	146[1]	219[1]	--	438[1]
Total Suspended Solids	mg/L	10	15	--	30
	lbs/day	146[1]	219[1]	--	438[1]
Settleable Solids	ml/L	0.1	--	--	0.2

Chlorine Residual	mg/L	--	--	--	0.1
	lbs/day	--	--	--	1.5[1]

Constituents	Units	Monthly Average	Weekly Average	7-Day Median	Daily Maximum
Total Coliform	MPN[2]/100 mL	--	--	23	240
Total Trihalomethanes	g/L	--	--	--	100

[1] Value based upon a design capacity of 1.75 mgd
[2] Most Probable Number

3. The arithmetic mean of BOD_5 and of total suspended solids in Discharge 002 samples collected over a monthly period shall not exceed 15 percent of the arithmetic mean of the values for influent samples collected at approximately the same times during the same period (85 percent removal), or a maximum of 30 mg/L, whichever is less.

4. Discharge 002 shall not have a pH be less than 6.0 or greater than 9.0.

5. Survival of aquatic organisms in 96-hour bioassays of undiluted waste shall be no less than:

   a. Minimum for any one bioassay.. 70%

   b. Median for any three or more consecutive bioassays.............................. 90%

E. Sludge Specifications

Sludge in this document means the solid, semisolid, and liquid residues removed during primary, secondary, or advanced wastewater treatment processes. Solid waste refers to grit and screening material generated during preliminary treatment. Residual sludge means sludge that will not be subject to further treatment at the WWTF. Biosolids refers to sludge that has undergone sufficient treatment and testing to qualify for reuse pursuant to federal and state regulations as a soil amendment for agriculture, silviculture, horticulture, and land reclamation.

1. Sludge and solid waste shall be removed from screens, sumps, ponds, clarifiers, etc. as needed to ensure optimal plant operation.

2. Treatment and storage of sludge generated by the WWTF shall be confined to the WWTF property and conducted in a manner that precludes infiltration of waste constituents into soils in a mass or concentration that will violate Groundwater Limitations.

3. Any storage of residual sludge, solid waste, and biosolids on property of the WWTF shall be temporary and controlled and contained in a manner that minimizes leachate formation and precludes infiltration of waste constituents into soils in a mass or concentration that will violate Groundwater Limitations.

4. Residual sludge, biosolids, and solid waste shall be disposed of in a manner approved by the Executive Officer and consistent with Title 27. Removal for further treatment, disposal, or

reuse at sites (i.e., landfill, WWTF, composting site, soil amendment sites) operated in accordance with valid waste discharge requirements issued by a regional water quality control board will satisfy this specification.

5. Use of biosolids shall comply with General Biosolids Order (State Water Resources Control Board Water Quality Order No. 2000-10-DWQ, *General Waste Discharge Requirements for the Discharge of Biosolids to Land for Use as a Soil Amendment in Agricultural, Silvicultural, Horticultural, and Land Reclamation Activities).* The Discharger must file a "Notice of Intent" for each biosolids use project to be eligible for coverage under the General Biosolids Order. Alternatively, use of biosolids as a soil amendment shall comply with valid waste discharge requirements issued by a regional water quality control board.

6. Use and disposal of biosolids should comply with the self-implementing federal regulations of 40 CFR 503, which are subject to enforcement by the EPA, not the Board. If during the life of this Order the State accepts primacy for implementation of 40 CFR 503, the Board may also initiate enforcement where appropriate.

F. Receiving Water Limitations

Receiving Water Limitations are based upon water quality objectives contained in the Basin Plan. The discharge shall not cause the following in the receiving surface water (i.e., Kings River):

1. Concentrations of dissolved oxygen to fall below 7.0 mg/L.

2. Electrical conductivity to exceed 200 µmhos/cm.

3. Oils, greases, waxes, or other materials that create nuisance, result in a visible film or coating on the surface of the water or on objects in the water, or otherwise adversely affect beneficial uses.

4. Chlorine to be detected in concentrations equal to or greater than 0.01 mg/L.

5. Pesticides or combinations of pesticides to be detected in concentrations that adversely affect beneficial uses.

6. Discoloration that creates nuisance or adversely affects beneficial uses.

7. Biostimulatory substances that promote aquatic growths in concentrations that create nuisance or adversely affect beneficial uses.

8. Deposition of material that causes nuisance or adversely affects beneficial uses.

9. Normal ambient pH to fall below 6.5 or exceed 8.3. Changes in ambient pH shall not exceed 0.3 units.

10. Suspended material in concentrations that cause nuisance or adversely affect beneficial uses. As a means of discerning compliance, the discharge shall not cause turbidity to increase more than:

    a. 1 Nephelometric Turbidity Unit (NTU) when background turbidity is between 0 and 5 NTU.

    b. 20 percent when background turbidity is between 5 and 50 NTU.

    c. 10 NTU when background turbidity is between 50 and 100 NTU.

    d. 10 percent when background turbidity is greater than 100 NTU.

11. Normal ambient temperature to increase more than 5°F.

12. Radionuclides to be present in concentrations that exceed maximum contaminant levels specified in Title 22, CCR; that harm human, plant, animal or aquatic life; or that result in the accumulation of radionuclides in the food web to an extent that presents a hazard to human, plant, animal, or aquatic life.

13. Toxic pollutants to be present in the water column, sediments, or biota in concentrations that adversely affect beneficial uses; that produce detrimental physiological responses in human, plant, animal, or aquatic life.

14. Taste- or odor-producing substances to impart undesirable tastes or odors to water or to fish flesh or other edible products of aquatic origin or in concentrations that cause nuisance or otherwise adversely affect beneficial uses.

15. Floating material in amounts that cause nuisance or adversely affect beneficial uses.

16. Fecal coliform concentration in any 30-day period to exceed a geometric mean of 200 MPN/100 mL or cause more than 10 percent of total samples to exceed 400 MPN/100 mL.

17. Violation of any applicable water quality standard for receiving waters adopted by the Board or the State Water Resources Control Board pursuant to the CWA and regulations adopted thereunder.

G. Groundwater Limitations

Release of waste constituents from any storage, treatment, or disposal component associated with the WWTF shall not, in combination with other sources of the waste constituents, cause groundwater under and beyond the WWTF and discharge area(s) to exceed any of the following:

1. Constituent concentrations specified below or natural background concentration, whichever is greater:

a. Total coliform organisms of 2.2 MPN/100 mL.
b. Total nitrogen in excess of 10 mg/L.
c. For constituents identified in Title 22 (as described in Finding No. 58), the MCLs quantified therein.

2. Constituent concentrations listed below or natural background concentration, whichever is greater:

Constituent	Units	Limitation
Boron	mg/L	0.7
Chloride	mg/L	175
EC	μmhos/cm	1,000
Sodium	mg/L	115
Total Dissolved Solids[1]	mg/L	600

[1] A cumulative constituent comprised of dissolved matter consisting mainly of inorganic salts, small amounts of organic matter, and dissolved gases [e.g., ammonia, bicarbonate alkalinity, boron, calcium, chloride, copper, iron, magnesium, manganese, nitrate, phosphorus, potassium, sodium, silica, sulfate, total alkalinity]

3. Taste- or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses, including but not limited to, ammonia (as N) in excess of 0.5 mg/L or natural background, whichever is greater.

4. Constituent concentrations identified as follows or natural background concentration, whichever is greater: toxic substances in concentrations that produce detrimental physiological responses in human, plant, or animal life; or chemical constituents and pesticides in concentrations that adversely affect beneficial uses.

H. Pretreatment Requirements

1. The Discharger shall implement the necessary legal authorities, programs, and controls to ensure that the following incompatible wastes are not introduced to the treatment system, where incompatible wastes are:

a. Wastes which create a fire or explosion hazard in the treatment works;

b. Wastes which will cause corrosive structural damage to treatment works, but in no case wastes with a pH lower than 5.0, unless the works is specially designed to accommodate such wastes;

c. Solid or viscous wastes in amounts which cause obstruction to flow in sewers, or which cause other interference with proper operation or treatment works;

d. Any waste, including oxygen demanding pollutants (BOD, etc.), released in such volume or strength as to cause inhibition or disruption in the treatment works, and subsequent treatment process upset and loss of treatment efficiency;

e. Heat in amounts that inhibit or disrupt biological activity in the treatment works, or that raise influent temperatures above 40 °C (104°F), unless the treatment works is designed to accommodate such heat;

f. Petroleum oil, nonbiodegradable cutting oil, or products of mineral oil origin in amounts that will cause interference or pass through;

g. Pollutants which result in the presence of toxic gases, vapors, or fumes within the treatment works in a quantity that may cause acute worker health and safety problems; and

h. Any trucked or hauled pollutants, except at points predesignated by the Discharger.

2. The Discharger shall implement the legal authorities, programs, and controls necessary to ensure that indirect discharges do not introduce pollutants into the sewerage system that, either alone or in conjunction with a discharge or discharges form other sources:

a. Flow through the system to the receiving water in quantities or concentrations that cause a violation of this Order, or

b. Inhibit or disrupt treatment processes, treatment system operations, or sludge processes, use, or disposal and either cause a violation of this Order or prevent sludge use or disposal in accordance with this Order.

3. The Discharger shall enforce the requirements promulgated under sections 307(b), (c), (d), and 402(b) of the CWA. The Discharger shall cause industrial users subject to federal categorical standards to achieve compliance no later than that date specified in those requirements or, in the case of a new industrial user, upon commencement of the discharge.

4. The Discharger shall comply with all pretreatment requirements contained in 40 CFR Part 403 and perform the pretreatment functions required in 40 CFR 403, including, but not limited to:

a. Implementing the necessary legal authorities as provided in 40 CFR 403.8(f)(1);

b. Enforcing the pretreatment requirements under 40 CFR 403.5 and 403.6;

c. Implementing the programmatic functions as provided in 40 CFR 403.8(f)(2);

d. Providing the requisite funding and personnel to implement the pretreatment program as provided in 40 CFR 403.8(f)(3); and

e. Publishing a list of industrial users which were in significant noncompliance and applicable pretreatment requirements as required by 40 CFR 403.8(f)(2)(vii).

f. Conducting inspections in accordance with provisions of 40 CFR 403.8(f)(1)(v) and 403.8(f)(2)(v) and ensuring compliance with pretreatment standards and requirements by (1) assessing and collecting, when appropriate, civil penalties and civil administrative penalties in accordance with Government Code sections 54740, 54740.5, and 54740.6, or (2) other equally effective means.

Noncompliance shall subject the Discharger to enforcement actions, penalties, fines, and other remedies by the EPA, Board, or other appropriate parties, as provided in the Clean Water Act (CWA), as amended.

I. Water Recycling Specifications

The following specifications apply to use areas under the ownership and control of the Discharger. Other use areas are covered by separate water recycling requirements.

1. Use of recycled water as permitted by this Order shall comply with all the terms and conditions of the most current Title 22 provisions and require the submittial of a Title 22 Engineering report signed by a California State registered civil engineer prior to any recycling practices.

2. All users of recycled water shall provide for appropriate backflow protection for potable water supplies as specified in Title 17, CCR, section 7604, or as specified by DHS.

3. Recycled water shall remain within the permitted Use Area.

4. Use of recycled water shall be limited to flood irrigation of fodder, fiber, and seed crops. Any irrigation of food crops requires prior DHS Food and Drug Branch approval.

5. Application of wastewater, biosolids, and commercial fertilizer to use areas shall be at reasonable agronomic rates considering the crop, soil, climate, and irrigation management system. The annual nutrient loading of use areas, including the nutritive value of organic and chemical fertilizers and of the recycled water shall not exceed the crop demand.

6. The Discharger shall maintain the following setback distances from areas irrigated with recycled water:

Setback Distance (feet)	To
25	Property Line
30	Public Roads
50	Drainage Courses
100	Irrigation Wells
150	Domestic Wells

7. The perimeter of use areas shall be graded to prevent ponding along public roads or other public areas.

8. Areas irrigated with recycled water shall be managed to prevent breeding of mosquitoes. More specifically:

    a. All applied irrigation water must infiltrate completely within a 48-hour period.

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

    c. Low-pressure and unpressurized pipelines and ditches accessible to mosquitoes shall not be used to store recycled water.

9. Recycled water shall be managed to minimize runoff onto adjacent properties not owned or controlled by the Discharger.

10. Recycled water used for irrigation shall be managed to minimize erosion.

11. Recycled water shall be managed to minimize contact with workers.

12. If recycled water is used for construction purposes, it shall comply with the most current edition of *Guidelines for Use of Recycled Water for Construction Purposes*. Other uses of recycled water not specifically authorized herein shall be subject to the approval of the Executive Officer and shall comply with Title 22.

13. Public contact with recycled water shall be precluded through such means as fences, signs, or acceptable alternatives. Signs with proper wording (shown below) of a size no less than four inches high by eight inches wide shall be placed at all areas of public access and around the perimeter of all areas used for effluent disposal or conveyance to alert the public of the use of recycled water. All signs shall present the international symbol similar to that shown in Attachment F and present the following wording:

RECYCLED WATER - DO NOT DRINK

AGUA DE DESPERDICIO RECLAMADA - POR FAVOR NO TOME

J. Provisions

1. The Discharger shall comply with all the items of the *Standard Provisions and Reporting Requirements for Waste Discharge Requirements (NPDES)*, dated 1 March 1991, which are part of this Order. This attachment and its individual paragraphs are referred to as Standard Provision(s).

2. The Discharger shall comply with Monitoring and Reporting Program No. 5-01-257 (MRP), which is a part of this Order, and any revisions thereto as ordered by the Executive Officer. When requested by EPA, the Discharger shall complete and submit Discharge Monitoring

Reports (DMR). If the Discharger wishes to submit a single report to satisfy the request for the DMR and comply with the MRP, the submittal date shall be no later than the submittal date specified in the MRP for the report.

3. The Discharger shall conduct the chronic toxicity testing specified in the Monitoring and Reporting Program when discharge is via Discharge 002. If the testing indicates that the discharge causes, has the reasonable potential to cause, or contributes to an in-stream excursion above the water quality objective for toxicity, the Discharger shall submit a work plan to conduct a Toxicity Reduction Evaluation (TRE) and, upon Executive Officer approval of the work plan, conduct the TRE. If necessary, this Order will be reopened and a chronic toxicity limitation included and/or a limitation for the specific toxicant identified in the TRE. Additionally, if a chronic toxicity water quality objective is adopted by the State Water Resources Control Board, this Order may be reopened for consideration of including an effluent limitation based on that objective.

4. The Discharger shall not allow pollutant-free wastewater to be discharged into the collection, treatment, and disposal system in amounts that significantly diminish the system's capability to comply with this Order. Pollutant-free wastewater means rainfall, groundwater, cooling waters, and condensates that, without treatment, are essentially free of pollutants.

5. **By 15 April 2002**, the Discharger shall submit a sludge management plan that satisfies the information requirements of Attachment E *Information Needs for Sludge Management Plan*. A California registered civil engineer experienced in sludge disposal must prepare and certify the sludge management plan. Following written approval of the sludge management plan from the Executive Officer, this Provision shall be considered satisfied.

6. The Discharger shall comply with the following time schedule in conducting a study of the potential effects in the effluent and the receiving surface water of the priority pollutant constituents referenced in Finding Nos. 71 and 72 :

Task	Compliance Date	
Submit work plan and time schedule	**February 2002**	Now June 14
Begin study	**May 2002**	
Complete study	**May 2003**	
Submit Study Report	**July 2003**	

If the study indicates that Discharge 002 has a reasonable potential to cause or contribute to an in-stream excursion above a water quality objective, the Discharger shall include in the Study Report information to calculate effluent limitations for those constituents. The Discharger shall submit to the Board on, or before each compliance date, the specified document or written report detailing compliance or noncompliance with the specific task and date. If noncompliance is reported, the Discharger shall state the reasons for noncompliance and include an estimate of the date when the Discharger will be in compliance. The Discharger shall notify the Board by letter when it returns to compliance with the time schedule. The Study Report is subject to Executive Officer approval and shall be prepared and certified by a California registered civil engineer experienced in wastewater treatment and surface water effluent disposal.

If, after review of the study results, it is determined that Discharge 002 has a reasonable potential to cause or contribute to an exceedance of a water quality objective this Order will be reopened and effluent limitations added for the subject constituents.

7. **By 15 April 2002,** the Discharger shall complete a hydrogeologic investigation within the area affected and potentially affected by the WWTF and submit a technical report to the Executive Officer. The technical report, which shall be prepared and professionally certified by a geologist registered to practice in California, shall describe the underlying geology, existing wells (active and otherwise), local well construction practices and standards, well restrictions, and hydrogeology. The report shall recommend representative monitoring zones of the uppermost aquifer with consideration given to the Discharger's existing data and provide a detailed evaluation of the existing monitoring well network. The recommendations shall be reviewed and approved as appropriate by the Executive Officer.

8. **Within 90 days following Executive Officer approval of representative monitoring zones in accordance with Provision J.7**, the Discharger shall submit a technical report proposing a modified groundwater monitoring network. The technical report shall consist of a Monitoring Well Installation Work Plan for a network that satisfies Attachment F, *Standard Monitoring Well Provisions for Waste Discharge Requirements*. The network shall include one or more background monitoring wells and sufficient number of wells to evaluate performance of BPTC measures and to determine compliance with this Order's Groundwater Limitations. These include monitoring wells immediately downgradient of every treatment, storage, and disposal unit that does or may release waste constituents to groundwater with the exception of wastewater Use Areas to which the Discharger applies effluent at reasonable agronomic rates. Monitoring wells shall comply with applicable Well Standards. Monitoring of wells constructed to yield representative samples from approved monitoring zones within the uppermost aquifer in accordance with the Order's Monitoring and Reporting Program shall comprise the representative zone monitoring program. Implementation of the Monitoring Well Installation Work Plan shall be subject to the prior approval of the Executive Officer.

9. The Discharger shall comply with the following compliance schedule in implementing the groundwater monitoring network approved by the Executive Officer in Provision J.8:

	Task	Compliance Date
a.	Implement Monitoring Well Installation Workplan	150 days following Workplan approval by the Executive Officer
b.	Complete Monitoring Well Installation	60 days following Workplan implementation

	Task	Compliance Date
c.	Submit Monitoring Well Installation Report of Results	30 days following Project Completion
d.	Commence Groundwater Monitoring	30 days following Project Completion
e.	Submit technical report that characterizes natural background water quality in approved representative monitoring zones for all monitored constituents	365 days following completion of task 9.d

Technical reports submitted pursuant to this Provision shall be prepared and certified by a California registered civil engineer or geologist, and are subject to Executive Officer approval.

10. Compliance with groundwater limitations will be evaluated based on the approved representative zone monitoring program following completion of Provision J.9, task e. Should the Discharger fail to comply with the schedule to characterize natural background groundwater quality at the approved monitoring zone(s) by the date specified in Provision I.9, task e, the Board shall not consider the lack of natural background characterization as sufficient defense to enforcement for violations of Groundwater Limitations G.1 through G.4.

11. **By 1 February 2002,** the Discharger shall submit a map identifying all of the monitored water supply wells along with a table indicating the owner of the well, purpose of the well (i.e., domestic or agricultural supply well) and any available California Department of Water Resources information relative to well construction. The Discharger shall also include a summary of all data collected from each well.

12. **By 15 June 2002,** the Discharger shall submit a written work plan in the form of a technical report that sets forth a schedule for a systematic and comprehensive technical evaluation of each major component of the WWTF's waste treatment and disposal systems (i.e., discharge to both ponds and river). The report shall determine best practicable treatment and control (BPTC) as used in Resolution 68-16 for each waste constituent. The technical report shall contain a preliminary evaluation of each component and propose a time schedule for completing the comprehensive technical evaluation. The technical report shall be prepared and certified by a California registered civil engineer. The schedule to complete all comprehensive technical evaluations shall be as short as practicable, and shall not exceed **two years.** Upon written determination of adequacy by the Executive Officer of the technical report, this Provision shall be considered satisfied.

13. By the schedule approved by the Executive Officer pursuant to Provision J.12, but no later than **15 December 2004,** the written comprehensive technical evaluation shall be submitted with the Discharger's written recommendations for WWTF modifications (e.g., component upgrade, retrofit, and disposal method), as necessary to achieve BPTC. The report shall include specific methods the Discharger proposes as a means to measure processes and assure continuous optimal performance of BPTC measures. Comprehensive technical evaluations shall be prepared and certified by a California registered civil engineer. The source of funding and

proposed schedule for modifications shall be identified. The schedule shall be as short as practicable but in no case shall completion of the necessary improvement exceed **four years** past the Executive Officer's determination of the adequacy of the comprehensive technical evaluation submitted pursuant to this Provision unless the schedule is reviewed and specifically approved by the Board. The component evaluation, recommended improvements, and schedule are subject to the Executive Officer's review and determination.

14. The groundwater limitations set forth in this Order are not final and not an entitlement. By **15 December 2004,** the Discharger shall submit a technical report that proposes specific numeric groundwater limitations that reflect full implementation of BPTC and compliance with the most stringent applicable water quality objectives for that waste constituent. The report shall describe how these were determined considering actual data from compliance monitoring wells, impact reductions through full implementation of BPTC, reasonable growth, the factors in Water Code section 13241, State Water Resources Control Board Resolution No. 68-16, the Basin Plan, etc. The most stringent applicable water quality objective shall be interpreted based on the Regional Board policy entitled Application of Water Quality Objectives on pages IV-21 through IV-23 of the Basin Plan. If the Discharger wishes the Board to consider a proposed water quality objective where the stringency of a proposed water quality objective can vary according to land use, it must provide documentation from similar third-party government authorities that there is no potential for the more sensitive land use to occur and the reason that provides protection for only less sensitive uses. The Discharger should submit results of a validated groundwater model to support its proposal.

15. Upon completion of tasks set forth in Provisions J.13 and J.14, the Board shall consider the evidence provided in determining whether the Discharger has justified BPTC and the proposed specific numeric groundwater limitations for each waste constituent that reflects full implementation of BPTC. The Board will consider the documentation and recommendation for the governing water quality objective, and if this is an accepted value, will consider reopening this Order to establish the proposed maximum permissible limitation as the final numerical groundwater limitation that complies with Resolution 68-16.

16. **By 15 December 2006,** the Discharger shall submit a written technical report on the overall status of compliance with implementation of BPTC and compliance with all groundwater limitations.

17. In addition to Pretreatment Requirements H.1 through H.3, the Discharger shall develop and implement a Pretreatment Program, subject to Board approval. To satisfy this Provision, the Discharger shall comply with the following time schedule:

Tasks	Compliance Date
a. Submit the results of an industrial user survey.	**1 Jul 2002**
b. Submit documentation for proposed Legal Authority and Control Mechanism implementation, an Enforcement Response	**1 Dec 2002**

Program, and a list of resource allotments for the Pretreatment Program.

c. Submit a proposed Inspection Monitoring Program and Pretreatment Ordinance, which will implement the requirements of the Pretreatment Program. **1 Mar 2003**

In performing the work in this Provision, 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 being reported, the reasons for such noncompliance shall be stated, plus an estimate of the date when the Discharger will be in compliance. The Discharger shall notify the Board by letter when it returns to compliance with the time schedule.

18. **By 15 April 2002,** the Discharger shall submit documentation that it has re-issued Guardian an Industrial User Permit requiring, at a minimum, Guardian's discharge to the City's wastewater collection system to not exceed the following limitations according to 40 CFR section 433.15:

Constituent	Units	EPA
Cadmium	mg/L	0.49
Chromium	mg/L	1.96
Copper	mg/L	2.39
Lead	mg/L	0.49
Nickel	mg/L	2.81
Silver	mg/L	0.30
Zinc	mg/L	1.84
Cyanide	mg/L	0.85
TTO*	mg/L	1.50

* TTO = Total Toxic Organics

19. To increase Discharge 002 flows from the current design flow of 1.75 mgd, the Discharger shall submit a written report describing modifications to the WWTF disinfection process that ensure Discharge 002 flows greater than 1.75 mgd complies with River Discharge Specifications D.2 through D.5, particularly total coliform and chlorine residual effluent limitations. A California registered civil engineer shall certify the technical report. Following written approval of the technical report from the Executive Officer, this Provision shall be considered satisfied.

20. The Discharger shall implement water recycling whenever and wherever a reasonable opportunity arises to supply recycled water in place of or as a supplement to use of fresh water or better quality water, as for irrigation of commercial crops. This condition of discharge shall be self-implementing and subject to enforcement only if the Discharger

cannot demonstrate to the satisfaction of the Board that the exception was a recycling project not of maximum benefit to the people of the State. Whenever the Discharger requests an increase in discharge flow, it shall also submit a written technical report for accountability of compliance with this Provision.

21. The Discharger shall implement best practicable treatment and control, including proper operation and maintenance, to comply with this Order.

22. If the Board determines that waste constituents in the discharge have reasonable potential to cause or contribute to an exceedance of a limit for groundwater, this Order may be enforced or, alternately, reopened for consideration of addition or revision of appropriate numerical effluent or groundwater limitations for the problem constituents. The Board may consider inclusion of a compliance time schedule within the bounds of the applicable regulations if the Discharger is not able to meet a new discharge requirement immediately.

23. The Discharger shall submit to the Board on or before each report due date the specified document or, if an action is specified, a written report detailing evidence of compliance with the date and task. If noncompliance is being reported, the reasons for such noncompliance shall be stated, plus an estimate of the date when the Discharger will be in compliance. The Discharger shall notify the Board by letter when it returns to compliance with the time schedule.

24. The Discharger must 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. Section 13385(i) of the CWC requires the Board to issue mandatory minimum penalties for certain effluent violations.

25. Prior to making any change in the discharge point, place of use, or purpose of use of the wastewater, the Discharger shall obtain approval of or clearance from the State Water Resources Control Board (Division of Water Rights).

26. In the event of any change in control or ownership of land or waste treatment and storage facilities presently owned or controlled by the Discharger, the Discharger shall notify the succeeding owner or operator of the existence of this Order by letter, a copy of which shall be immediately forwarded to this office.

    To assume operation under this Order, the succeeding owner or operator must apply in writing to the Executive Officer requesting transfer of the Order. The request must contain the requesting entity's full legal name, the state of incorporation if a corporation, the address and telephone number of the persons responsible for contact with the Board and a statement. The statement shall comply with the signatory paragraph of Standard Provision B.3 and state that the new owner or operator assumes full responsibility for compliance with this Order. Failure to submit the request shall be considered a discharge without requirements, a violation of the California Water Code. Transfer shall be approved or disapproved in writing by the Executive Officer.

27. The conditions of this Order that pertain to surface water discharge, and serve as an NPDES permit expire on **7 December 2006**, at which time surface water discharge is prohibited without administrative continuance by the Board, pursuant to authorization in 40 CFR Part 122.6 and California Code of Regulations, Title 23, section 2235.4. The Discharger must file a complete Report of Waste Discharge in accordance with Title 23, CCR, section 13376, **180 days** before its permit expires, if it wishes a permit to continue the discharge.

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 7 December 2001.

GARY M. CARLTON, Executive Officer

Order Attachments:

Monitoring and Reporting Program
A. Location Map
B. Site Plan
C. Process Flow Diagram
D. Supply Well Monitoring Map
E. Information Needs for Sludge Management Plan
F. Standard Monitoring Well Provisions for Waste Discharge Requirements

Information Sheet

Standard Provisions (1 March 1991 version) (separate attachment to Discharger only)

DSS:JLK:12/7/01

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. 5-01-257

NPDES NO. CA0081230

MONITORING AND REPORTING PROGRAM
FOR
CITY OF REEDLEY
WASTEWATER TREATMENT FACILITY
FRESNO COUNTY

This Monitoring and Reporting Program (MRP) is required pursuant to Water Code section 13267. The Discharger shall not implement any changes to this MRP unless and until a revised MRP is adopted by the Board or issued by the Executive Officer. Sample station locations are depicted on Attachment C. Changes to sample location shall be established with concurrence of Board's staff, and a description of the revised stations shall be submitted to the Board and, following approval of the Executive Officer, attached by the Discharger to its copy of this Order. All samples should be representative of the volume and nature of the discharge or matrix of material sampled. The time, date, and location of each sample shall be recorded on the sample chain of custody form. All analyses shall be performed in accordance with Standard Provisions, Provisions for Monitoring.

INFLUENT MONITORING

Samples shall be collected at approximately the same time as effluent samples and should be representative of the influent. Influent monitoring shall include at least the following:

Constituent	Units	Type of Sample	Sampling Frequency
Flow	mgd	Meter	Continuous
Settleable Solids (SS)	ml/L	Grab	Daily
pH	pH units	Grab	Daily
EC[1]	µmhos/cm	Grab	Daily
BOD_5[2]	mg/L, lbs/day	24-hr Composite[3]	Weekly
TSS[4]	mg/L, lbs/day	24-hr Composite[3]	Weekly

1 Conductivity at 25°C
2 Five-day biochemical oxygen demand at 20°C
3 Composite samples shall consist of flow-proportioned grab samples
4 Total suspended solids

EFFLUENT MONITORING

Effluent sampling stations shall be established for the discharge to land (i.e., ponds or Board-approved use area(s), all designated as Discharge 001). Effluent sampling stations shall also be established for the discharge to the Kings River (Discharge 002). The Discharger shall collect samples representative of the volume and nature of the discharge from a point in the system following treatment and before discharge to ponds, the Kings River or use area(s). Time of collection of grab samples shall be recorded. Effluent monitoring shall include at least the following:

Constituent	Units	Type of Sample	Frequency[1]
Flow to Ponds	mgd	Meter	Continuous
Flow to Use Area(s)	mgd	Meter	Continuous
Settleable Solids	mL/L	Grab	Daily
pH	pH units	Grab	Daily
EC	µmhos/cm	Grab	3/Week[2]
BOD_5	mg/L, lbs/day	24-hr Composite[3]	Weekly[2]
Percent Removal	%	Calculated	
TSS	mg/L, lbs/day	24-hr Composite[3]	Weekly[2]
Percent Removal	%	Calculated	
Nitrate (as N)	mg/L	24-hr Composite[3]	Weekly[4]
Nitrite (as N)	mg/L	Grab	Weekly[4]
Ammonia (as N)	mg/L	24-hr Composite[3]	Weekly[4]
Total Kjeldahl Nitrogen	mg/L	24-hr Composite[3]	Weekly[4]
Total Nitrogen	mg/L, lbs/day	Calculated	Weekly[4]
Total Dissolved Solids (TDS)[5]	mg/L	Grab	Weekly
Oil and Grease	mg/L, lbs/day	Grab	Monthly
General Minerals[6]	mg/L	Grab	Quarterly[7]
Metals[8]	mg/L	Grab	Quarterly[7]
Priority Pollutants[9]	µg/L	Grab	2/year[10]

1 Daily, 3/week, and Weekly samples coincident with influent monitoring
2 One day between sample dates
3 Composite samples may consist of flow-proportioned grab samples
4 Weekly samples for first three months, twice monthly thereafter until the Discharger receives written approval from the Executive Officer to reduce frequency to once monthly.
5 TDS referenced hereafter in this program shall be determined using EPA Method No. 160.1 for combined organic and inorganic TDS and EPA Method No. 160.4 for inorganic TDS. Sample analyzed concurrently with EC sampling.
6 General Minerals analyte list is detailed below
7 Monitoring shall be performed in January, April, July, and October for the first year, in January and July thereafter
8 Metals referenced hereafter in this program shall include aluminum, arsenic, barium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, and zinc
9 Reporting shall conform with *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California* Reporting Requirements, section 2.4 et seq.
10 January and July, coincident with General Minerals analysis

General Minerals Analyte List

Bicarbonate (as $CaCO_3$)	Hardness (as $CaCO_3$)	Potassium
Boron	Iron	Sodium
Calcium	Magnesium	Sulfate
Carbonate (as $CaCO_3$)	Manganese	
Chloride	Phosphate	

Sample Collection and Preservation: Excepting effluent samples, any sample placed in an acid-preserved bottle must first be filtered through a 0.45 µm nominal pore size filter. If field filtering is not feasible, samples shall be collected in unpreserved containers and submitted to the laboratory within 24-hours with a request (on the chain-of-custody form) to immediately filter then preserve the sample

In addition to the monitoring in the preceding table, when discharge is to the Kings River (002), effluent monitoring shall also include at least the following:

Constituent	Units	Type of Sample	Frequency
Flow to Kings River	mgd	Meter	Continuous
Chlorine Residual[1]	mg/L	Grab	Daily
BOD_5	mg/L	24-hr Composite[2]	3/Week[3]
TSS	mg/L	24-hr Composite[2]	3/Week[3]
Total Trihalomethanes[1]	mg/L	Grab	Weekly
Chloroform[1]	mg/L	Grab	Weekly
Bromodichloromethane[1]	mg/L	Grab	Weekly
Temperature	°C (°F)	Grab	Daily
Ammonia[1,4]	mg/L	Grab	Weekly
Total Coliform Organisms	MPN[5]/100mL	Grab	Daily
Acute Toxicity[6]	% Survival	Grab	2/Quarter[7]

1 Record temperature and pH at time of sample collection
2 Composite samples may consist of flow-proportioned grab samples
3 At least one day between sample dates
4 Concurrent with biotoxicity monitoring
5 Most probable number
6 The test shall be a 96-hour static bioassay using rainbow trout (*Oncorhynchus mykiss*). Should the test results indicate toxicity, the Discharger shall report to the Board the results the next working day after the results are known to the Discharger.
7 Minimum of two samples per short-term discharge cycle (less than three months) with samples collected after startup and prior to shutoff. Two samples per quarter for extended discharges.

If results of any monitoring indicate that a pollutant appears to violate effluent limitations, but monitoring frequency is not sufficient to validate the violation, the sampling frequency shall be increased to confirm the magnitude and duration of the violation.

POND MONITORING

Permanent markers shall be placed in the ponds with calibration indicating the water level at design capacity and available operational freeboard. The freeboard shall be monitored on all ponds to the nearest tenth of a foot. Pond monitoring shall include at least the following:

Constituent	Units	Type of Sample	Frequency
Freeboard	feet	Observation	Daily
Dissolved Oxygen	mg/L	Grab[1]	As Required[2]

[1] Samples shall be collected at a depth of one foot from each pond, opposite the inlet. Samples shall be collected between 0800 and 0900 hours. Time of sampling shall be reported.

[2] If offensive odor is detected by or brought to the attention of WWTF personnel, monitor affected pond(s) daily until dissolved oxygen $\geq$ 1.0 mg/L.

In addition, the Discharger shall inspect the condition of disposal ponds once per week and write visual observations in a bound logbook. Notations shall include observations of whether weeds are developing in the water or along the bank, and their location; whether dead algae, vegetation, scum, or debris are accumulating on the pond surface and their location; whether burrowing animals or insects are present; and the color of the ponds (e.g., dark sparkling green, dull green, yellow, gray, tank brown, etc.). A summary of the entries made in the log during each month shall be submitted along with the monitoring report the following month. If the Discharger finds itself in violation of any General or Land Discharge Specifications, the Discharger shall briefly explain the action taken or to be taken to correct the violation.

RECEIVING SURFACE WATER MONITORING

All receiving water samples shall be grab samples. To the extent feasible, receiving water monitoring shall coincide with effluent monitoring and shall include at least the following (when discharging directly to the Kings River):

Station	Description
R-1	Not to exceed 300 feet upstream from the point of discharge to the Kings River unless the prescribed distance is inaccessible.
R-2	Not to exceed 300 feet downstream from the point of discharge to Kings River unless the prescribed distance is inaccessible.

Constituents	Units	Station	Frequency
Flow[1]	cfs	R-1	Daily
Flow Ratio[2]	---	---	Daily
Dissolved Oxygen	mg/L	R-1, R-2	Weekly
pH	pH units	R-1, R-2	Weekly

Constituents	Units	Station	Frequency
Turbidity	NTU	R-1, R-2	Weekly
Temperature	°C (°F)	R-1, R-2	Weekly
EC	µmhos/cm	R-1, R-2	Weekly
Chlorine Residual[3]	mg/L	R-1, R-2	Weekly
Fecal Coliform Organisms	MPN/100 mL	R-1, R-2	Weekly
Ammonia (as N)[4]	mg/L	R-1, R-2	Weekly
Nitrate (as N)	mg/L	R-1, R-2	Weekly
Total Nitrogen	mg/L	R-1, R-2	Weekly

1 From records provided by the Kings River Water Association, or other source
2 The calculated flow ratio between the Kings River and Discharge 002
3 Minimum detection limit shall be no greater than 0.01 mg/L
4 Temperature and pH shall be determined at the time of sample collection for the calculation of un-ionized ammonia

Until January 2003, Kings River samples shall be collected from R-1 on a monthly basis and analyzed for concentrations of copper, lead, zinc, and hardness. This monitoring is required regardless of whether direct river discharge occurs.

In conducting the receiving water sampling, a log shall be kept of the receiving water conditions throughout the reaches bounded by Stations R-l and R-2. Notes on receiving water conditions shall be summarized in the monitoring report. Attention shall be given to the presence or absence of:

a. Floating or suspended matter
b. Discoloration
c. Bottom deposits
d. Aquatic life
e. Visible films, sheens or coatings
f. Fungi, slimes, or objectionable growths
g. Potential nuisance conditions

THREE SPECIES CHRONIC TOXICITY MONITORING

Chronic toxicity monitoring shall be conducted once every three months during periods of direct river discharge; with the initial sampling to commence in first month of direct river discharge, to determine whether the effluent is contributing toxicity to the Kings River.

The testing shall be conducted as specified in *Short-Term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Water to Freshwater Organisms* (EPA 600/4-91-002, or latest edition). Chronic toxicity samples shall be collected at the discharge of the WWTF prior to its entering the river. Time of sample collection shall be recorded. Chronic toxicity monitoring shall include the following species: *Oncorhynchus mykiss*, *Ceriodaphnia dubia*, and *Selenastrum capricornutum*. The Discharger shall conduct the chronic toxicity testing using 100 percent effluent and two controls. If toxicity is found in any of the 100 percent tests, the Discharger must immediately retest using the full sampling protocol of the five dilutions listed below:

	Dilutions (%)					Controls	
Dilution Series:	100	75	50	25	12.5	River Water	Lab Water
% WWTF Effluent	100	75	50	25	12.5	0	0
% Dilution Water	0	25	50	75	87.5	100	0
% Lab Water	0	0	0	0	0	0	100

If toxicity is found in any of the 100 percent tests, in addition to retesting as described above, the Discharger shall conduct chronic toxicity monitoring on a monthly basis for at least four months or until such time that chronic toxicity is absent.

PRETREATMENT PROGRAM MONITORING

The Discharger shall submit an annual report to the Board, with copies to the EPA Regional Administrator and the State Water Resources Control Board, describing the Discharger's pretreatment activities over the previous 12 months. In the event that the Discharger is not in compliance with any conditions or requirements of this Order, the Discharger shall include the reasons for the noncompliance and state how and when the Discharger shall comply with such conditions and requirements. This annual report shall be submitted by **28 February** and shall contain, but not be limited to items G.1 through G.10 of *Standard Provisions and Reporting Requirements for Waste Discharge Requirements (NPDES)* dated 1 March 1991 (Standard Provisions).

In addition to the information required in the annual report, the Discharger shall report quarterly the information contained in G.4 (a through g) of Standard Provisions. Quarterly reports shall also describe progress towards compliance with audit or pretreatment compliance inspection requirements. Quarterly reports shall be submitted by **1st day of the second month following the end of each quarter**. The fourth quarterly report may be included as part of the annual report. If none of the aforementioned conditions exists, at a minimum, the Discharger must submit a letter certifying that all industries are in compliance and no violations or changes to the pretreatment program have occurred during the quarter.

SLUDGE MONITORING

To monitor whether discharges to the WWTF are interfering with the treatment process or lessening biosolids quality, the Discharger shall sample the sludge at least semiannually; specifically, the Discharger shall collect a composite sample of sludge in accordance with EPA's *POTW Sludge Sampling and Analysis Guidance Document*, August 1989, and tested for the following metals:

Arsenic	Lead	Selenium
Cadmium	Mercury	Silver[1]
Chromium	Molybdenum	Zinc
Copper	Nickel	

[1] Monitoring shall include silver until a period of one year following the City's adoption of a Board-approved industrial pretreatment program.

Sampling records shall be retained for a minimum of five years. A log shall be kept of sludge quantities generated and of handling and disposal activities. The frequency of entries is discretionary; however, the log should be complete enough to serve as a basis for part of the annual report. Prior to any disposal or land application of sewage sludge, or removal of sewage sludge from the WWTF, the monitoring and record keeping requirements of 40 CFR 503 shall be met.

By 15 March 2002, the Discharger shall submit characterization of sludge quality, including sludge percent solids and quantitative results of chemical analysis for the priority pollutants listed in 40 CFR 122 Appendix D, Tables II and III (excluding total phenols). All sludge samples shall be a composite of a minimum of twelve discrete samples taken at equal time intervals over 24 hours. Suggested methods for analysis of sludge are provided in EPA publications titled *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods* and *Test Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater*. Recommended analytical holding times for sludge samples should reflect those specified in 40 CFR 136.3(e). Other guidance is available in EPA's *POTW Sludge Sampling and Analysis Guidance Document, August 1989.*

GROUNDWATER MONITORING

Prior to collecting samples, the monitoring well shall be adequately purged to remove water that has been standing within the well screen and casing that may not be chemically representative of formation water. Depending on the hydraulic conductivity of the geologic setting, the volume removed during purging is typically from 3 to 5 volumes of the standing water within the well casing and screen, or additionally the filter pack pore volume.

At least quarterly and concurrently with groundwater quality sampling, the Discharger shall measure the water level in each well as groundwater depth (in feet and hundredths) and as groundwater surface elevation (in feet and hundredths above mean sea level). The horizontal geodetic location for each monitoring well shall be provided where the point of beginning shall be described by the California State Plane Coordinate System, 1983 datum.

In reporting the results of first quarterly sampling event performed pursuant to this MRP, the Discharger shall include a detailed description of the procedures and techniques for: (a) sample collection, including purging techniques, sampling equipment, and decontamination of sampling equipment; (b) sample preservation and shipment; (c) analytical procedures; (d) chain of custody control; and (e) data quality control/quality assurance procedures.

Samples shall be collected quarterly from approved groundwater monitoring wells and analyzed for the following constituents:

Constituent	Units	Type of Sample	Frequency
Total Organic Carbon	mg/L	Grab	Quarterly[1]
EC	µmhos/cm	Grab	Quarterly[1]
pH	pH units	Grab	Quarterly[1]
Total Kjeldahl Nitrogen	mg/L	Grab	Quarterly[1]
Nitrate-Nitrogen	mg/L	Grab	Quarterly[1]
Ammonia	mg/L	Grab	Quarterly[1]
Total Nitrogen	mg/L	Calculated	Quarterly[1]
Total Dissolved Solids	mg/L	Grab	Quarterly[1]
Metals	µg/L	Grab	Quarterly[1]
General Minerals	mg/L	Grab	Quarterly[1]
Total Coliform Organisms	MPN/100 mL	Grab	Quarterly[1,2]

[1] January, April, July and October

[2] The Discharger may propose one or more groundwater monitoring wells in the disposal pond vicinity for use as a dedicated well for monitoring total coliform organisms. Selection of the dedicated well(s) is subject to written Executive Officer approval. In the event coliform is detected in the dedicated well(s), the Discharger shall implement coliform monitoring in other wells, the selection of which shall be made with concurrence of Board staff.

WATER SUPPLY MONITORING

The Discharger shall establish source sample stations where representative samples of the City of Reedley's water supply can be obtained. The results shall be reported as a flow weighted average and be supplemented with supporting calculations. Source water monitoring shall include:

Constituent	Units	Type of Sample	Frequency
General Minerals	mg/L	Grab	Once every three years[1]
EC	µmhos/cm	Grab	Quarterly[1,2]
TDS	mg/L	Grab	Once every three years[3]

[1] January, April, July and October

[2] Quarterly for the first year, annually thereafter.

[3] Coincident with monitoring required by the California Department of Health Services

SOIL REMEDIATION SITE MONITORING

The Discharger shall collect representative soil samples from the soil remediation site (former sludge drying beds and lagoons as described in Finding Nos. 27 and 28). Samples shall be collected from depths of 4, 6, and 8 feet below the surface in accordance with the approved work plan described in Finding No. 29 and analyzed for nitrate (as N) and Total Kjeldahl Nitrogen. Sample locations shall be those previously approved by the Executive Officer. Additional sampling locations, if required, shall be approved by the Executive Officer. The sampling shall be biannual, occurring in **April and October** each year, until the Board provides the Discharger with written notification that its remediation efforts are complete.

REPORTING

The Discharger shall report monitoring data and information as required in this Monitoring Reporting Program and as required in the Standard Provisions and Reporting Requirements.

Monthly and quarterly monitoring reports shall be submitted to the Board by the **1st day of the second month** following sample collection, and include, at a minimum, monitoring data collected during the month (e.g., effluent pH and TSS). Samples taken annually shall be submitted with the monthly monitoring report following sample collection. In reporting the monitoring data, the Discharger shall arrange the data in tabular form so that the date, the constituents or parameters, and the concentrations or measurements are readily discernible. The data shall be summarized in a manner that clearly illustrates whether the discharge complies with waste discharge requirements. The highest daily maximum for the month, monthly and weekly averages, and medians, and removal efficiencies (%) for BOD_5 and TSS, should be determined and recorded. Incidences of noncompliance shall be identified, along with a description of corrective measures taken or planned to be taken to regain compliance. If any pollutant is monitored at the locations designated herein more frequently than is required by this Order, the results of such monitoring shall be included in the calculation and reporting of the values required in the monthly monitoring report. Such increased frequency shall be indicated in the tabulated data summarized in the monthly monitoring report.

By **1 February** of each year, the Discharger shall submit a written report to the Executive Officer containing the following:

a. The names and telephone numbers of persons to contact regarding the plant for emergency and routine situations;

b. The names, titles, certificate grade, and general responsibilities of persons operating and maintaining the wastewater treatment facility (Standard Provision A.5);

c. A certified statement of when monitoring and instrument devices were last calibrated (Standard Provision C.6).

d. A statement certifying whether the current operation and maintenance manual, and contingency plan, reflect the WWTF as currently constructed and operated, and the dates when these documents were last revised and last reviewed for adequacy.

e. The results of an annual evaluation conducted pursuant to Standard Provision B.5 and a figure depicting monthly average discharge flow for the past five years.

f. The most recent City of Reedley Annual Water Quality Report.

g. A summary of annual sludge monitoring data, including:

i. Annual sludge production in dry tons and percent solids.

ii. A schematic diagram showing sludge handling facilities and solids flow diagram.

iii. Depth of application and drying times for sludge-drying beds.

iv. A description of disposal methods for grit, screenings, sludge, and biosolids, include the following information related to the disposal methods used at the WWTF. If more than one method is used, include the percentage of annual grit, screenings, sludge, or biosolids disposed of by each method.

1. For **landfill disposal**, include: (a) the Order numbers of WDRs that regulate the landfill(s) used, (b) the present classifications of the landfill(s) used, and (c) the names and locations of the facilities receiving sludge.

2. For **land application**, include: (a) the locations of the site(s) including specific application areas within large sites and (b) the Order numbers of any WDRs that regulate the site(s).

3. For **incineration**, include: (a) the names and location of the site(s) where sludge incineration occurs, (b) the Order numbers of WDRs that regulate the site(s), (c) the disposal method of ash, and (d) the names and locations of facilities receiving ash (if applicable).

4. For **composting**, include: (a) the location of the site(s), and (b) the Order numbers of any WDRs that regulate the site(s).

h. A summary of groundwater monitoring, including:

i. Hydrographs showing the groundwater elevation in each approved well for at least the previous five years or to the extent that such data are available, whichever is fewer. The hydrographs should show groundwater elevation with respect to the elevations of the top and bottom of the screened interval and presented at a scale of values appropriate to show trends or variations in groundwater elevation. The scale of the background plots shall be the same as that used to plot downgradient elevation data.

ii. A description and graphical presentation of the gradient and direction of groundwater flow under the area encompassing the Facility and its disposal ponds.

iii. Graphs of the laboratory analytical data for all samples taken from each approved well within at least the previous five calendar years (as data become available). Each such graph shall plot the concentration over time of one or more tabulated constituent for a given monitoring well, at a scale appropriate to show trends or variations in water quality. The graphs shall plot each datum, rather than plotting mean values. For any given constituent, the scale for the background plots shall be the same as that used to plot downgradient data. Separate graphs shall show hydrologic equipotential gradients and equal concentration gradients for evaluated constituents.

iv. All monitoring analytical data obtained during the previous four quarterly reporting periods, presented in tabular form, as well as 3.5" computer diskettes (or submitted separately via e-mail), either in MS-DOS / ASCII format or in another file format acceptable to the Executive Officer (e.g., Microsoft Excel).

v. A comprehensive discussion of the compliance record, and the result of any corrective actions taken or planned that may be needed to bring the Discharger into full compliance with the waste discharge requirements.

The report shall discuss the compliance record for the reporting period. If violations have occurred, the report shall also discuss the corrective actions taken and planned to bring the discharge into full compliance with this Order.

All reports submitted, as a condition of in response to this Order shall comply with the signatory requirements in Standard Provision D.6. Reports submitted concerning facility performance must also be signed and certified by the chief plant operator. When reports contain laboratory analyses performed by the Discharger and the chief plant operator is not in the direct line of supervision of the laboratory, reports must also be signed and certified by the chief of the laboratory.

The Discharger shall implement the above monitoring program on the first day of the month following effective date of this Order.

Ordered by:__________________________________
GARY M. CARLTON, Executive Officer

7 December 2001
(Date)

DSS:JLK:12/7/01

INFORMATION SHEET

ORDER NO. 5-01-257
CITY OF REEDLEY
WASTEWATER TREATMENT FACILITY
FRESNO COUNTY

GENERAL INFORMATION

The City of Reedley (Discharger or City) applied for a permit renewal to discharge wastes from its wastewater treatment facility (WWTF) under the National Pollutant Discharge Elimination System (NPDES). The WWTF serves industry and about 20,940 City residents. The Discharger discharges combined domestic and industrial treated wastewater from its WWTF to on-site ponds for disposal by evaporation and percolation, and occasionally to the Kings River, a water of the United States. The discharge from the WWTF is currently governed by Waste Discharge Requirements Order No. 95-110 (NPDES Permit No. CA0081230), adopted by the Board on 26 May 1995.

The WWTF has a design capacity of 3.5 million gallons per day (mgd) and currently treats a monthly average flow of about 2.45 mgd. Lift stations outside of the WWTF provide the necessary head to gravity feed the wastewater into the WWTF. The Discharger samples influent prior to the wastewater passing through a mechanically raked arc bar screen where large debris (e.g., rags) is removed. Debris filtered by the bar screen is discharged to a bin and hauled to a landfill. After the bar screen, the wastewater passes through a parshall flume (there are two, but only one operates at a time) where flows are ultrasonically measured, then into the oxidation ditch where it begins biological treatment. There are no grit chambers at the headworks; therefore, grit and small debris passing through the bar screen end up in the oxidation ditch. The Discharger has plans to replace the coarse bar screen with a fine (7 mm) screen to more effectively remove the debris. From the oxidation ditch the treated wastewater flows to two parallel operated clarifiers. Maintenance of either clarifier is not possible since both are needed to handle current flow levels. From the clarifiers the effluent is pumped through two spiral screw pumps where it is gravity discharged to one of seven ponds. The ponds encompass a total area of approximately 34 acres. When discharge is to the Kings River, effluent is either pumped from one of the ponds or discharged directly into the chlorination/dechlorination unit prior to its discharge into the river. The maximum flow through the chlorination/dechlorination unit is 1.75 mgd. Sludge is pumped from the secondary clarifiers through two dewatering centrifuge units into trucks and hauled off-site. The centrate is returned to the oxidation ditch. A flow process diagram of the WWTF is shown on Attachment C, a part of the proposed Order.

Pretreatment

The City's Ordinance implementing its industrial pretreatment program is found in Chapter 8, Title IX of the City's Municipal Code. The City issues an Industrial User Permit (IUP) for each permitted industrial discharger discharging wastes to its WWTF. A total permitted industrial discharge of about 0.23 mgd flows to the WWTF collection system. Other industrial users discharging into the WWTF include Ito Packing Company Inc., one of the nation's largest stone fruit processing companies. There are four industrial users permitted by the City's IUP program, including one user listed under the federal metal finishing category (40 CFR 433). The Discharger's IUP program currently does not fully implement Title 40, Code of Federal Regulations (CFR), Part 403, since it does not implement the monitoring required for categorical users. The Discharger also has not submitted its IUP program for Board approval.

Two major permitted industrial users include Safety-Kleen Systems, Inc's. Reedley Recycle Center (Safety-Kleen) and Guardian Industries (Guardian). Safety-Kleen is a waste handling facility that receives wastes generated primarily from automotive repair shops, machine shops and photo developers. Safety-Kleen reclaims silver from the photochemical wastes. Guardian manufactures glass mirrors, laminated glass, security glazed glass and insulating glass.

The United States Environmental Protection Agency (EPA), Region 9, inspected both Safety-Kleen and Guardian on 24 August 1999 and 25 August 1999, respectively. Regional Board staff also attended the inspections. According to the EPA inspection report, prior to July 1999, Safety-Kleen discharged its wastes directly to the City's WWTF and frequently exceeded permitted limits for oil and grease, boron and conductivity. Seven instances of solvent fumes noticeable at the WWTF were attributed to Safety-Kleen Reedley. Since July 1999, Safety-Kleen has shipped its photochemical wastes off-site, which eliminated discharge violations for boron by reducing the average concentration from nearly 30 to less than 0.1 mg/L and reducing the average conductivity from 25,000 to 500 μmhos/cm. Safety-Kleen installed a plate coalescing oil/water separator in January 2000 and, since late February 2000 has reduced the maximum oil and grease concentration from over 1,000 to less than 100 mg/L, the City's local discharge limit. Current operations at the facility do not qualify it as a federal categorical industry.

Guardian qualifies as a federal categorical industrial user and is subject to the federal pretreatment standards in 40 CFR 433.15 for metal finishing operations. These standards require existing source operations to comply with the following daily-maximum and monthly-average standards:

40 CFR 433.15 Subpart A – Metal Finishing Category Pretreatment Standards for Existing Sources *Adjusted to account for dilution from the domestic sewage and water supply preconditionin brines according to 40CFR 403.6(e).		
Pollutant or pollutant property	Maximum for any one day, (mg/L)	Monthly average shall not exceed, (mg/L)
Cadmium (total)	0.49	0.18
Chromium (total)	1.96	1.21
Copper (total)	2.39	1.46
Lead (total)	0.49	0.30
Nickel (total)	2.81	1.68
Silver (total)	0.30	0.17
Zinc (total)	1.84	1.04
Cyanide (total)	0.85	0.46
Total Toxic Organics	1.50	----

Current Sludge Management Operations

Sludge is generated from two secondary clarifiers. Sludge that is not returned to the oxidation ditch is pumped to two dewatering centrifuge units, which the Discharger installed in 1996. The Discharger placed the centrifuged sludge in lined ponds for further drying until land application to cropland by local farmers. The Discharger discontinued this practice due to nuisance odors and, since January 1998, Earthwise Organics has hauled all centrifuged sludge off-site to San Joaquin Compost Facility in Lost

Hills, California (WDRs Order No. 96-018). The City produced about 630, 550 and 480 dry tons of biosolids in 1998, 1999 and 2000, respectively. The Discharger attributes the reduced sludge generation to improved operation of the oxidation ditch and reduced numbers of filamentous organisms in the ditch. The centrate from the dewatering centrifuge units is returned to the oxidation ditch. The Discharger's current sludge management operation reflects best practicable treatment and control (BPTC) and is not likely to impact groundwater.

Past Sludge Management Operations

Prior to 1996, the Discharger's sludge handling included discharge to shallow unlined drying beds and to deeper unlined lagoons when the beds were full. The Discharger utilized the unlined beds and lagoons for sludge drying for over twenty years, a process that has impacted the underlying soil and shallow groundwater.

Degradation and Pollution

The soil types in the WWTF area consist of Hanford fine sandy loam, Tujunga loamy sand, and Grangeville soils, according to the USDA Soil Conservation Service *Soil Survey of Eastern Fresno Area, California, 1971*. These soils are all derived from recent alluvium deposited on alluvial fans, or on channels, and generally lack or have weakly developed subsoils. Permeability is moderate to high. Drillers logs of the fourteen monitoring wells installed to a maximum depth of 80 feet throughout the WWTF site indicate predominantly sandy soils to about 30 feet underlain by intermittent silty and clayey sands.

Regional groundwater occurs about 40 feet below ground surface and flows south-southwesterly, according to information in *Lines of Equal Elevation of Water in Wells in Unconfined Aquifer*, published by DWR in Spring 1999. The Discharger has been monitoring groundwater pursuant to WDRs Order No. 91-057 through a network of wells that began with the installation of six monitoring wells throughout the WWTF property in late 1992. Due to high nitrates detected in wells nearest the former sludge drying beds and lagoons, the Discharger installed eight additional monitoring wells, with the last well completed in July 1997. Quarterly Discharger reports from 1999 to and including the first quarter 2001 indicate groundwater beneath the WWTF site varies from 15 to over 30 feet below site grade (bsg). This variation is due to surface relief rather than a steep groundwater gradient, which flows generally towards the southeast, towards the Kings River. The groundwater gradient shows mild seasonal fluctuations, likely due to effluent mounding from the ponds and effects from the various river stages. Data from the early 1990s, the end of a six-year drought, indicated a northwesterly gradient, away from the Kings River. The regional groundwater conditions (i.e., wet or drought weather patterns) seem to have a stronger affect on the groundwater gradient. The WWTF effluent percolating through the ponds currently flows towards the river, but in the early 1990s flowed away from the river. The following table identifies each of the monitoring wells:

CITY OF REEDLEY WWTF
GROUNDWATER MONITORING WELLS

Well Number	Location*	Casing Depth (ft.)	Slotted Interval	Well Head Elevation**
MW1	NW Corner Former Sludge Drying Area	45	25-45	320.73
MW2	NE of Plant #2	44	24-44	316.74
MW3	Off-Site, NE of Facility	40	20-40	314.44
MW4	W Prop. Boundary, NW Pond 7	50	30-50	318.17
MW5	SW Corner of Facility, SW Corner Pond 7	46	26-46	313.36
MW6	S Prop. Boundary, SE Corner Pond 7	38	18-38	313.51
MW14	SE Corner of Facility, E of Oxidation Ditch	37	17-37	307.85
MW15	SW of Former Sludge Drying Area	42	17-42	320.17
MW16	SE Prop. Boundary, SE Ponds 4 and 5	***	***	310.50
MW18	N Prop. Boundary, W of Kings River Road	60	45-60	324.88
MW19	N Prop. Boundary, W of MW18	40	25-40	325.17
MW20	N Prop. Boundary, NW Corner of Facility	50	30-50	327.17
MW21	Off-Site, N of Facility Along Kings R. Rd.	60	45-60	324.09
MW22	N Prop. Boundary, W of MW1	74	54-74	321.57

* See Attachment B of proposed Order
** Elevation above mean sea level
*** Construction details were not available for this monitoring well

The Discharger analyzes groundwater samples for an extensive list of constituents. The Discharger discovered nitrate pollution in the initial round of sampling in monitoring wells MW1-MW3, in the vicinity of the unlined sludge drying beds and lagoons. Recent groundwater monitoring data are summarized below:

1999 and 2000 Groundwater Monitoring Results

Well	Nitrate (as N, in mg/L)			EC (µmhos/cm)		
Number	Maximum	Minimum	Average	Maximum	Minimum	Average
MW1	30	4	15	1410	890	1100
MW2	32	5	25	880	780	830
MW3	29	6	25	1090	900	990
MW4	10	0	6	780	540	670
MW5	10	0	5	820	540	690
MW6	9	0	5	750	550	660
MW14	8	1	4	820	660	720
MW15	26	5	16	1340	880	1120
MW16	12	2	6	810	580	680
MW18	14	0	10	1050	750	930

Well Number	Nitrate (as N, in mg/L) Maximum	Minimum	Average	EC (µmhos/cm) Maximum	Minimum	Average
MW19	9	0	3	1100	830	970
MW20	3	0	1	460	280	360
MW21	23	0	16	1280	760	1150
MW22	9	1	5	770	490	680

The Discharger's monitoring results indicate groundwater pollution with nitrate (as N) exceeding the maximum contaminant level (MCL) of 10 mg/L (California Code of Regulations Title 22, Division 4, Chapter 15, *Domestic Water Quality and Monitoring*). In 1993, the Board directed the Discharger to sample all domestic water supply wells within ½ mile of the WWTF. The Discharger gained access to and sampled seven domestic water supply wells in the area (locations shown on Attachment D of the proposed Order). The Discharger initially sampled wells SW7-SW13 in April 1993 and again in February 1994. The Discharger sampled wells SW8, SW10, SW12 and SW17 quarterly in 1998 and analyzed for the same constituents as the groundwater monitoring wells. The samples exhibited nitrate (as N) concentrations ranging from 3.5 to 25 mg/L (average = 8.8 mg/L) and EC values ranging from 360 to 1,100 µmhos/cm (average = 563 µmhos/cm). The maximum nitrate (as N) and EC concentrations were obtained in the sample collected in April 1998 from domestic supply well SW12, which is northwest of the WWTF. The Discharger has not provided well construction details of any of the water supply wells sampled and discontinued its sampling program following the 1998 quarterly sampling. Well locations and construction details are pertinent to analyzing the collected data. Additional sampling may be required to further assess WWTF impacts to the area groundwater.

Pursuant to Board request in 1994, the Discharger began investigating the area encompassed by the sludge drying beds and lagoons. The Discharger collected soil samples through six test pits at two-foot intervals to 10 feet and analyzed samples for pH, sodium, potassium, calcium, carbonate, bicarbonate, chloride, sulfate, nitrate, ammonia-nitrogen, total Kjeldahl nitrogen, specific conductance, and cation exchange capacity. The results of the investigation indicated the following nitrate concentrations:

Summary of Soil Nitrate (as N) Results, (in mg/kg)
Sampled 20 September 1994

Sample Depth	Test Pit S1	S2	S3	S4	S5	S6	S7	S8
0	4	49	105	15	21	152	600	440
2	6	3	18	0	28	38		
4	5	153	39	11	27	18		
6	11	132	6	ND	54	9		
8	5	361	4	16	26	7		
10	30	200	19	8	105	10		

Test Pit Locations:

- S1 and S2 are background. However, S-2 is just west of the sludge lagoons and probably too close to be considered background
- S3 - S6 were placed in the sludge drying beds and lagoons
- S7 and S8 were placed in the area where biosolids were temporarily stored

The investigation produced ambiguous results with nitrate (as N) concentrations decreasing with depth in some borings and increasing with depth in others. Unfortunately, not one of the test pits was sampled below 10 feet

On 21 July 1997, the Discharger submitted a technical report, *City of Reedley Sludge Storage Site Nitrogen Levels Investigation and Closure Plan*, (hereafter Closure Plan) prepared by Provost & Pritchard Engineering Group, Inc. The Closure Plan proposed measures to remediate nitrate contaminated soils by planting crops to uptake the nitrogen. The primary nitrate contaminated area identified by the consultant was limited to a ½-acre site previously used to store biosolids and scrapings from the pond bottoms. The Plan also proposed monitoring the remediation progress with biannual soil sampling.

The Board conditionally approved the Closure Plan in September 1997, and provided final approval by letter dated 27 October 1997, where the Discharger requested to plant eucalyptus trees instead of annual crops. The Board approved the Closure Plan in October 1997 that included a request by the Discharger to substitute planting of eucalyptus trees instead of other annual crops. The Discharger implemented the Closure Plan by demolishing the north half of the sludge drying beds and lagoons (hereafter referred to as soil remediation site) and filling this area with nitrate contaminated soil from the former biosolids storage area and with soils from the bottoms of some of the WWTF ponds. The City retained the southernmost drying beds and lagoon area for emergency backup in case the centrifuge units become inoperable.

The Discharger planted approximately 1,000 eucalyptus trees in the soil remediation site in March 1998 and collected an initial round of soil samples in April 1999. In May 1999, a staff inspection confirmed the eucalyptus planting and stated the trees were about 2 feet tall and appeared healthy. In January 2001, a staff inspection documented that the majority of the eucalyptus trees were dead and those remaining appeared stressed. The Discharger indicated the reason for the die-off was an unavoidable valley-wide disease affecting eucalyptus trees. The Discharger analyzed soil samples in May and intends to sample again in October of 2001 from the area to gage the progress of the soil remediation efforts. The May results indicate little progress primarily due to the poor condition of the trees. Because of the Discharger's limited and somewhat disjointed efforts to investigate this area, the horizontal and vertical limits of contamination remain unclear.

The Board issued the Discharger a Notice of Violation (NOV), dated 9 May 2001, based on the groundwater nitrate pollution detected in its quarterly groundwater monitoring reports. The NOV required the Discharger to submit the following by 6 July 2001:

- A Work Plan analyzing existing groundwater information that includes a proposal for determining the horizontal and vertical extent of groundwater degradation and pollution and a proposal for groundwater remediation

- An engineering report evaluating the soil remediation efforts conducted to date

The Board extended the 6 July 2001 deadline to 31 August 2001 at the request of the Discharger, which stated that the groundwater data is too extensive to evaluate in such a short time frame. In addition to the groundwater and soil issues, the NOV requires the Discharger to submit a technical report addressing potential capacity concerns with the City's WWTF.

Effluent Land Disposal/Recycling

The Discharger's primary effluent disposal method is to discharge to ponds adjacent to the Kings River for disposal by evaporation and percolation. Total disposal pond area is 33.83 acres. Discharge is to the Kings River only when there is insufficient pond capacity. The most recent discharge to the river occurred 13 April through 12 July 1998. The Discharger began a pond maintenance program of ripping disposal pond bottoms in 1999 that increased the percolation rates so that the Discharger was able to dispose of all effluent in 2000 by discharging only to ponds 5 and 7 (14.47 acres total). Monthly nitrates and monthly daily average flows from Discharger Self-Monitoring Reports were used to determine the annual nitrogen loadings per acre for 2000. See loading table below:

YEAR 2000 NITROGEN LOADING PER ACRE

Month	Ave Flow (mgd)	Effluent Nitrogen (mg/L)	Nitrogen[1] Applied (lbs/acre)	Applied[2] Nitrogen (MCL = 10 mg/L)
January	2.296	11.9	488	410
February	2.35	12.5	491	393
March	2.342	10.4	435	419
April	2.369	7.4	303	303
May	2.468	4.2	185	185
June	2.563	12.7	563	443
July	2.595	12.3	570	464
August	2.685	10.7	513	480
September	2.624	13.1	594	454
October	2.493	6.6	294	294
November	2.339	16.3	659	404
December	2.309	16.5	681	413
	Total lbs/acre/year		**5,780**	**4,660**

1 Nitrogen Applied = Ave Flow (mgd) x Effluent Nitrogen (mg/L) x 8.34[3] x month days / 14.47 acres
2 Applied Nitrogen = Ave Flow (mgd) x 10 (mg/L) x 8.34[3] x month days / 14.47 acres
3 8.34 = lbs water / gallon = lbs / million gallons / milligrams per liter

From the table above, the year 2000 nitrate nitrogen applied to the ponds is about 5,780 pounds per acre. If the effluent contained a maximum nitrate nitrogen concentration of 10 mg/L (the MCL), then the applied nitrate nitrogen would have been 4,660 pounds per acre, a difference of 1,120 pounds per acre.

The average daily flows from the loading table above minus the estimated annual pond evaporation were used in determining the total annual acre-feet of effluent applied to the ponds for the year 2000. The average annual evapotranspiration rate is about 51.3 inches, according to the California Irrigation Management Information System Reference Evapotranspiration map. The pan evaporation rate is typically the evapotranspiration rate divided by 0.7, which equates to about 73.3 inches/year. According to *Water in Environmental Planning*, by Thomas Dunne and Luna Leopold, the pond evaporation is typically about 90 percent of the pan evaporation rate. Therefore, the pond evaporation for 2000 should be about 66 inches/year or about 5-½ feet. Total evaporation would be about 80 acre-feet. An estimate of the percolated effluent is determined from the table and calculations presented below:

ACRE-FEET EFFLUENT APPLIED

Month	Average Daily Flow (mgd)	Monthly Flow(Acre-Feet)
January	2.296	218.45
February	2.35	209.16
March	2.342	222.82
April	2.369	218.12
May	2.468	234.81
June	2.563	235.98
July	2.595	246.89
August	2.685	255.46
September	2.624	241.60
October	2.493	237.19
November	2.339	215.36
December	2.309	219.68
	Total =	**2755.52**

Total Acre-Feet Applied = 2,750

Acre-Feet Evaporation = 80

Acre-Feet Percolation (Perc) = 2,670

Total Pond Acres = 14.47

Height of Water Column of Applied Effluent =

Perc / Total Pond Acres = 184.4 feet

Round to **180 feet**

As calculated above, the Discharger applied over 180 feet of effluent that contained about 42 tons nitrate nitrogen to ponds 5 and 7 in 2000. Groundwater is only 10 to 15 feet below the bottom of the ponds. With so little separation to groundwater and so much water applied, attenuation in the soil profile is unlikely. The Discharger's monitoring results of the wells closest to ponds 5 and 7 (wells MW4, MW5, MW6, and MW16) indicate occasional nitrate (as N) concentrations that equal or exceed the MCL of 10 mg/L. A sample collected in January 2000, from MW16 near pond 5, contained the maximum nitrate (as N) concentration of 12 mg/L. Since the Discharger has polluted area groundwater with nitrate from its historical sludge management operations, there is reasonable potential for the current effluent disposal operations to further impact groundwater by contributing additional nitrates. Further, due to the occasional reversal of groundwater flow, the disposal of effluent by groundwater recharge may spread pollution underlying the soil remediation site outward towards domestic and agriculture supply wells.

Order No. 95-110 required the Discharger to submit by 1 July 1995 a final land management plan demonstrating compliance with Reclamation Specifications for a proposed 23-acre use area. The Discharger submitted the plan on 28 November 1995 but never conducted any recycling at the site. Order No. 95-110 further required the Discharger to submit by 1 December 1995 a Work Plan demonstrating 30 percent recycling of its effluent by 1 January 1998. The Discharger submitted the Work Plan on 12 December 1995. The following goals were listed in the Work Plan: (1) reduce the level of nitrates in groundwater to either the MCL of 10 mg/L (as N) or the background level, whichever is greatest; (2) minimize evaporation losses in the percolation ponds; (3) eliminate discharge to the Kings River; and (4) provide a buffer for pond capacity. To achieve the stated goals by the 1 January 1998 date, the Discharger proposed the following tasks and due dates:

WORK PLAN TASKS

Task	Due Date	Description
1	01/01/96	Begin reporting pond freeboard and depths; and calculating the percent percolated, evaporated, recycled and discharged to the Kings River.
2	02/01/96	Begin negotiations with area farmers for effluent recycling.
3	02/01/96	Begin negotiations with Consolidated Irrigation District (CID) to explore recycling potential requiring that recycled water should not co-mingle with CID's water.
4	02/15/96	Conduct a nitrogen uptake study in Pond 1 with the planting of seasonal grasses or wheat.
5	08/01/96	Begin preparation of Design Report and Design Project for recycled water pumping facilities.
6	07/01/97	Begin construction of recycled water facilities. Completion anticipated during 1998 calendar year.
7	1998	Report recycled water results at end of growing and harvest season.

The Discharger has essentially completed tasks 1-3 of the above Work Plan. However, efforts undertaken for task 3 have not proved fruitful. Management from both Consolidated and Alta Irrigation Districts are of the opinion that percolation is the most beneficial use of the WWTF's effluent. The Discharger has not made any progress towards completing tasks 4-7 and has not complied with the recycling requirements of its current Order.

The Basin Plan and Beneficial Uses of Receiving Waters

The Board adopted a *Water Quality Control Plan for the Tulare Lake Basin, Second Edition* (hereafter Basin Plan), which designates beneficial uses, establishes water quality objectives, and contains implementation plans and policies for waters of the Basin. The Basin Plan identifies beneficial uses of the Kings River downstream of the discharge as municipal and domestic, agricultural, industrial process, water contact and noncontact water recreation, warm freshwater habitat, wildlife habitat, and groundwater recharge. The Basin Plan identifies the beneficial uses of underlying groundwater as municipal, domestic, industrial process and service, and agricultural supply.

The Basin Plan indicates that degradation of groundwater in the Tulare Lake Basin by salts is unavoidable without a plan for removing the salts from the Basin. In the absence of a valley wide drain to carry salts out of the valley, the Basin Plan indicates that the only other solution is to manage the rate of degradation by minimizing the salt loads to groundwater. The Board implements this policy, in part, by prescribing effluent salinity limits in waste discharge requirements for all discharges to land in the Basin. The Basin Plan's discharge salinity limit consists of narrative and numerical limits:

> "The incremental increase in salts from use and treatment must be controlled to the extent possible. The maximum EC shall not exceed the EC of the source water plus 500 µmhos/cm. When the source water is from more than one source, the EC shall be a weighted average of all sources."

Water in the Tulare Lake Basin is in short supply, requiring importation of surface waters from other parts of the State. The Basin Plan encourages reclamation on irrigated crops wherever feasible and indicates that where opportunities exist to replace uses of fresh water with reclaimed water, evaporation of reclaimable wastewater is not an acceptable permanent disposal method. Since the WWTF has a design flow above 1.0 mgd, the Basin Plan requires that the WWTF provide at least 80 percent BOD and total suspended solids (TSS) removal or a monthly average effluent BOD and TSS concentration of not more than 40 mg/L each, whichever is more restrictive.

Antidegradation

The antidegradation directives of section 13000 of the California Water Code require that waters of the State that are better in quality than established water quality objectives be maintained "consistent with the maximum benefit to the people of the State." Waters can be of high quality for some constituents or beneficial uses and not others. Policies and procedures for complying with this directive are set forth in the Basin Plan (including by reference State Water Board Resolution No. 68-16, "Statement of Policy With Respect to Maintaining High Quality Waters in California," or "Antidegradation" Policy).

Resolution 68-16 is applied on a case-by-case, constituent-by-constituent basis in determining whether a certain degree of degradation can be justified. It is incumbent upon the Discharger to provide technical information for the Board to evaluate that fully characterizes:

- all waste constituents to be discharged, the background quality of the uppermost layer of the uppermost aquifer
- the background quality of other waters that may be affected
- the underlying hydrogeologic conditions
- waste treatment and control measures
- how treatment and control measures are justified as best practicable treatment and control
- the extent the discharge will impact the quality of each aquifer
- the expected degradation compared to water quality objectives

In allowing a discharge, the Board must comply with CWC section 13263 in setting appropriate conditions. The Board is required, relative to the groundwater that may be affected by the discharge, to implement the Basin Plan and consider the beneficial uses to be protected along with the water quality objectives essential for that purpose. The Board need not authorize the full utilization of the waste assimilation capacity of the groundwater (CWC section 13263(b)) and must consider other waste discharges and factors that affect that capacity. The applicable beneficial uses (industrial, agricultural, and domestic supply in this instance), procedure for application of water quality objectives, and the process for and factors to consider in allocating waste assimilation capacity are set forth in the Basin Plan.

The discharge has been occurring for years. Certain waste constituents in municipal wastewater are not fully amenable to waste treatment and control and it is reasonable to expect some impact on groundwater. Some degradation for certain constituents is consistent with maximum benefit to the people of California because the technology, energy, water recycling, and waste management advantages of municipal wastewater service to the State far outweigh the environmental impact damage to the City of Reedley that would otherwise be reliant on numerous concentrated individual wastewater systems. Economic prosperity of valley communities is of maximum benefit to the people of California, and therefore sufficient reason to accommodate increases in wastewater discharge provided terms of reasonable degradation are defined and met. The proposed Order authorizes some degradation consistent with the maximum benefit to the people of the State.

Groundwater monitoring data at this site, while abundant, is insufficient to establish the most appropriate receiving water limits. In addition, as explained elsewhere in this Information Sheet, certain aspects of waste treatment and control practices may not have been met and, if not, are unlikely to be justified as representative of BPTC (e.g., use of percolation ponds and no reclamation). Reasonable time is necessary to gather specific information about the facility and the site to make informed, appropriate, long-term decisions. This proposed Order, therefore, establishes receiving water limitations to assure protection of the beneficial uses of waters of the State pending the completion of certain tasks and provides time schedules to complete specified tasks. The tasks provide that the Discharger is expected to identify, implement, and adhere to best practicable treatment and control as individual practices are reviewed and upgraded in this process. During this period, degradation may occur from certain constituents, but can never exceed water quality objectives (or background water quality should it exceed objectives) or cause nuisance.

Water Quality Objectives

The discharge must be conducted in a manner to ensure compliance with the Board's water quality objectives. These in turn define the least stringent limits that could apply as water quality limitations for receiving waters affected by the discharge. The Basin Plan prescribes narrative and numeric objectives for surface water addressing *bacteria, biostimulatory substances, chemical constituents*, color, *dissolved oxygen, floating material*, oil and grease, pH, pesticides, radioactivity, *salinity*, sediment, *settleable material, suspended material*, tastes and odors, *temperature, toxicity, and turbidity*. The discharge has the potential to degrade surface receiving waters for those constituents / characteristics shown in italics.

Constituent	Discussion
Bacteria	In waters designated for contact recreation, the fecal coliform concentration based on a minimum of not less than five samples for any 30-day period shall not exceed a geometric mean of 200 MPN/100 mL, nor shall more than ten percent of the total number of samples taken during any 30-day period exceed 400 MPN/100 mL. The proposed Order contains limits and monitoring requirements to ensure compliance with this objective.
Biostimulatory substances	These are primarily nutrients that become available to support aquatic growth. The water quality objective does not allow biostimulatory substances that promote aquatic growth in concentrations that cause nuisance or adversely affect beneficial uses.
Chemical constituents	These include a number of organic and inorganic chemicals. Waters designated as domestic or municipal water supplies (most surface waters) must meet the MCLs for drinking waters. The table below lists the water quality objectives for chemical constituents that may be present in the discharge.
Color	The objective is that water shall be free of discoloration that causes nuisance or adversely affects beneficial uses. The discharge is not expected to cause color changes provided the Discharger complies with the pretreatment requirements of this proposed Order.
Dissolved oxygen	Numerical dissolved oxygen objectives have been set for various uses and specific water bodies. Dissolved oxygen objectives for the Kings River have been incorporated as receiving water limits because the discharge's organic loading will consume oxygen.
Floating material	The objective states that waters shall not contain floating material in amounts that cause nuisance or adversely affect beneficial uses. The discharge is not expected to add floating material provided it complies with the proposed Order's effluent limitations.
pH	The pH of surface waters shall not be depressed below 6.5 nor raised above 8.3. Changes in ambient pH shall not exceed 0.3. Averaging periods may be allowed provided that beneficial uses will be fully protected. The proposed Order contains limits and monitoring requirements to ensure compliance with this objective.
Pesticides	The pesticide objectives require protection of beneficial uses, compliance with antidegradation policies and concentrations that shall not exceed the lowest levels technically and economically achievable.

Constituent	Discussion
Settleable material	Waters shall not contain substances in concentrations that result in the deposition of material that causes nuisance or adversely affects beneficial uses. The proposed Order contains limits and monitoring requirements to ensure compliance with this objective.
Suspended material	Waters shall not contain suspended material in concentrations that cause nuisance or adversely affect beneficial uses. The proposed Order contains limits and monitoring requirements to ensure compliance with this objective.
Tastes and odors	Water shall not contain taste- or odor-producing substances in concentrations that impart undesirable tastes or odors to domestic or municipal water supplies or to fish flesh or other edible products of aquatic origin, or that cause nuisance, or otherwise adversely affect beneficial uses. The discharge is not expected to add taste- or odor-producing substances.
Temperature	Temperature objectives that apply to various uses and water bodies have been incorporated as receiving water standards because the discharge may impact water temperatures. The proposed Order contains limits and monitoring requirements to evaluate compliance with this objective.
Toxicity	Water shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life. This objective applies regardless of whether the toxicity is caused by a single substance or the interactive effect of multiple substances. The proposed Order contains limits and monitoring requirements to evaluate compliance with this objective.
Turbidity	Numerical limits have been established for turbidity attributable to controllable water quality factors and these have been set as receiving water limits. The proposed Order contains limits and monitoring requirements to ensure compliance with this objective.

The Basin Plan also contains narrative and numeric objectives for groundwater addressing *bacteria*, *chemical constituents*, pesticides, radioactivity, salinity, *tastes and odors*, and *toxicity*. The discharge has the potential to degrade groundwater for those constituents / characteristics shown in italics.

Constituent	Discussion
Bacteria	In groundwaters used for domestic or municipal supply the most probable number of coliform organisms over any seven-day period shall be less than 2.2/100 mL.
Chemical constituents	Groundwaters shall not contain chemical constituents in concentrations that adversely effect beneficial uses. Waters designated as domestic or municipal water supplies must meet the maximum contaminant levels (MCLs) for drinking waters. These include a number of organic and inorganic chemicals, as described in the table "Chemical Constituents." In the event that background groundwater water quality

Constituent	Discussion
	already exceeds the objective, the background quality would become the water quality limitation for groundwater.
Tastes and odors	Groundwaters shall not contain taste- or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses. The WWTF operation and its various land discharges (e.g., percolation ponds) may release ammonia into underlying groundwater and cause ammonia levels to exceed the taste and odor threshold of 0.5 mg/L. The proposed Order contains monitoring requirements to evaluate compliance with this objective.
Toxicity	Groundwaters shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life. This objective applies regardless of whether the toxicity is caused by a single substance or the interactive effect of multiple substances. The proposed Order contains groundwater monitoring for trihalomethanes to evaluate compliance with this objective.

The values below reflect water quality objectives that must be met to maintain specific beneficial uses of groundwater. Unless natural background for a constituent proves higher, the groundwater quality objective is the most stringent of the values listed for the listed constituents.

Chemical Constituents

Constituent	Units	Value	Beneficial Use	Criteria or Justification
Ammonia	mg/L	0.5	MUN[1]	Taste and Odor[2]
Boron	mg/L	0.7	AGR[3]	Boron sensitivity[4]
Chloride	mg/L	106	AGR[3]	Chloride sensitivity on certain crops irrigated via sprinklers[4]
		142	AGR[3]	Chloride sensitivity on certain crops[4]
		175	AGR[3]	Chloride sensitivity on certain crops[5]
		250	MUN[1]	Recommended Secondary MCL[6]
		500	MUN[1]	Upper Secondary MCL[6]
Conductivity (EC)	µmhos/cm	700	AGR[3]	Salt sensitivity[4]
Conductivity (EC)		900	MUN[1]	Recommended Secondary MCL[6]
		1,600	MUN[1]	Upper Secondary MCL[6]
Iron	mg/L	0.3	MUN[1]	Secondary MCL[7]
Manganese	mg/L	0.05	MUN[1]	Secondary MCL[7]
Nitrate (as N)	mg/L	10	MUN[1]	Primary MCL[8]
Nitrite (as N)	mg/L	1	MUN[1]	Primary MCL[8]
pH	pH units	6.5 t	MUN[1]	Secondary MCL[9]

Chemical Constituents

Constituent	Units	Value	Beneficial Use	Criteria or Justification
Sodium	mg/L	69	AGR[3]	Sodium sensitivity on certain crops[4]
Total Coliform Organisms	MPN/100mL	2.2	MUN[1]	Tulare Lake Basin Plan
Total Dissolved Solids	mg/L	450	AGR[3]	Salt sensitivity[4]
		500	MUN[1]	Recommended Secondary MCL[6]
		1,000	MUN[1]	Recommended Upper MCL[6]
Total Trihalomethanes	µg/L	100	MUN[1]	MCL[10]
Chloroform	µg/L	1.1	MUN[1]	Narrative Toxic Criteria[11]
Bromodichloromethane	µg/L	0.27	MUN[1]	Narrative Toxic Criteria[11]
Bromoform	µg/L	4.3	MUN[1]	Narrative Toxic Criteria[11]
Dibromochloromethane	µg/L	0.37	MUN[1]	Narrative Toxic Criteria[11]

1 Municipal and domestic supply
2 Council of the European Union, On the Quality of Water Intended for Human Consumption, Council Directive 98/83/EC (3 November 1998)
3 Agricultural supply
4 Ayers, R. S. and D. W. Westcot, Water Quality for Agriculture, Food and Agriculture Organization of the United Nations – Irrigation and Drainage Paper No. 29, Rev. 1, Rome (1985)
5 Agricultural Salinity Assessment and Management, American Society of Civil Engineers, Manuals and Reports on Engineering Practice No. 71, New York (1996)
6 Title 22, California Code of Regulations (CCR), section 64449, Table 64449-B
7 Title 22, CCR, section 64449, Table 64449-A
8 Title 22, CCR, section 64431, Table 64431-A
9 United States Environmental Protection Agency
10 Title 22, CCR, section 64439
11 California Environmental Protection Agency, Office of Environmental Health Hazard Assessment Cancer Potency Factor as a Drinking Water Level, *California Environmental Protection Agency Toxicity Criteria Database*

Sodium and chloride can cause foliar damage to crops that are sprinkler irrigated. Trees, vines, and woody species are the most susceptible. To protect crops near the WWTF that could be sprinkler irrigated (e.g., peaches, nectarines, plums, and vines), the applied water should not contain values of sodium or chloride above 115 and 175 mg/L, respectively, according to *Agricultural Salinity Assessment and Management*, published by the American Society of Civil Engineers. Even though these values are higher than those recommended by the Guidelines (i.e., 69 mg/L for sodium and 106 mg/L for chloride), it is appropriate to use them as water quality objectives at this location because of salt concentrations apparent in area groundwater.

Municipal wastewater contains numerous dissolved inorganic waste constituents (i.e., salts, minerals) that together comprise total dissolved solids (TDS). Not every constituent is critical to beneficial use. Constituents that are critical are individually listed. The cumulative impact from these other constituents, along with the cumulative affect of the constituents that are individually listed, can be effectively controlled using TDS as a generic indicator parameter. Most dissolved inorganic substances in water are in the ionized form and so contribute to a solution's ability to carry an electrical current, or its "electrical conductivity" (EC). EC varies both with the number and type of ions the solution contains and is strongly temperature dependent. It is standard practice to report a solution's EC at 25° Celsius (this value is technically called "specific conductance"). Only ions can carry a current, however. Un-ionized species of weak acids or bases will not carry a current, nor will uncharged soluble organic materials, such as ethyl alcohol and glucose, even though these constituents comprise a portion of TDS. Although EC is affected by the nature of the various ions, their relative concentrations, and ionic strength of the water, EC measurements can give a practical estimate of the variations in a solution's dissolved mineral content. An empirical factor may be developed from simultaneous measurements of TDS and EC that allows for the rapid estimation of TDS from EC measurements.

Treatment Technology and Control

Given the character of municipal wastewater, secondary treatment technology is generally sufficient to control degradation of groundwater from decomposable organic constituents. Adding disinfection significantly reduces populations of pathogenic organisms, and reasonable soil infiltration rates and unsaturated soils can reduce them further. Neither organics nor total coliform, the indicator parameter for pathogenic organisms, should be found in groundwater in a well-designed, well-operated facility.

Municipal wastewater typically contains nitrogen in concentrations greater than water quality objectives, which vary according to the form of nitrogen. Degradation by nitrogen can be controlled by an appropriate secondary treatment system (e.g., oxidation ditch), tertiary treatment for nitrogen reduction, and agronomic reuse on harvested crops. The effectiveness varies, but generally, best practicable treatment and control should be able to control nitrogen degradation at a concentration well below the water quality objectives.

Waste constituents that are forms of salinity pass through the treatment process and soil profile and effective control of long-term affects relies upon effective source control and pretreatment measures. In the best of circumstances, long-term land discharge of treated municipal wastewater will degrade groundwater with salt (as measured by TDS and EC) and the individual components of salts (e.g., sodium and chloride). Not all TDS constituents pass through the treatment process and soil profile in the same manner or rate. Chloride tends to pass through both rapidly to groundwater. As chloride concentrations in most groundwaters in the region are much lower than in treated municipal wastewater, chloride is a useful indicator parameter for evaluating the extent to which effluent reaches groundwater. Other indicator constituents for monitoring for groundwater degradation due to recharged effluent include total coliform bacteria, ammonia, and total nitrogen. The Basin Plan states that groundwaters "shall be maintained free of toxic substances in concentrations that produce detrimental physiological responses in human, plant, animal, or aquatic life associated with designated beneficial uses."

Boron is another TDS constituent that may occur in wastewater in concentrations greater than groundwater depending on the source water, to the extent residents use cleaning products containing boron, and whether any industrial dischargers utilize boron (e.g., glass production, cosmetics). Still other constituents in treated municipal waste that may pass through the treatment process and the soil profile include recalcitrant organic compounds (e.g., ethylene glycol, or antifreeze), radionuclides, and pharmaceuticals. Hazardous compounds are not usually associated with domestic wastes and when present are reduced in the discharge to inconsequential concentrations through dilution with domestic waste, treatment, and the implementation of effective pretreatment programs.

A discharge of wastewater that overloads soils with nutrients and organics can result in anaerobic conditions in the soil profile, which in turn creates organic acids and decreases soil pH. Under conditions of low soil pH (i.e., below 5), iron and manganese compounds in the soil can solubilize and leach into groundwater. Discharge of residual sludge to land may also lead to increases in groundwater alkalinity and hardness to concentrations that impair the water's beneficial uses and contribute to an overall increase in TDS. Overloading is preventable and does not constitute BPTC as used in Resolution 68-16. Elevated concentrations in groundwater compared to percolating effluent of dissolved iron and dissolved manganese, along with elevated alkalinity, and hardness are useful indicators to determine whether components of the WWTF with high-strength waste constituents, such as sludge handling facilities, are ineffective in containing waste.

Title 27

Title 27, CCR, section 20380 et seq. ("Title 27"), contains regulations to address certain discharges to land. Title 27 establishes a waste classification system, specifies siting and construction standards for full containment of classified waste, requires extensive monitoring of groundwater and the unsaturated zone for any indication of failure of containment, and specifies closure and post-closure maintenance requirements. Generally, no degradation of groundwater quality by any waste constituent is acceptable.

Discharges of domestic sewage and treated effluent can be treated and controlled to a degree that will not result in unreasonable degradation of groundwater. For this reason, they have been conditionally exempted from Title 27, except for residual sludge and solid waste generated as part of the treatment process [section 20090(a) of Title 27]. The condition requires that the discharge not result in violation of any water quality objective in groundwater.

Treatment and storage facilities for sludge that are part of the WWTF are considered exempt from Title 27 under section 20090(a), under the condition that the facilities not result in a violation of any water quality objective. However, residual sludge (for the purposes of the proposed order, sludge that will not be subjected to further treatment by the WWTF) is not exempt from Title 27. Solid waste (e.g., grit and screenings) that results from treatment of domestic sewage and industrial waste also is not exempt from Title 27. This residual sludge and solid waste are subject to the provisions of Title 27.

Accordingly, the municipal discharge of effluent and the operation of treatment or storage facilities associated with a municipal wastewater treatment plant can be allowed without requiring compliance with Title 27, but only if resulting degradation of groundwater is in accordance with the Basin Plan. This means, among other things, degradation of groundwater must be consistent with Resolution 68-16 and in no case greater than water quality objectives.

TERMS AND CONDITIONS

As in other WDRs for municipal discharges recently adopted by the Board, the proposed Order implements a two-phased approach to setting final groundwater limitations. While the Board has determined that some degradation is in the public interest, it cannot yet determine how much due to incomplete data and evaluation of treatment and control measures. In Phase 1 of this 'implementation approach,' WDRs orders establish receiving water limitations that assure protection of the beneficial uses of groundwater pending the completion of certain tasks in accordance with a time schedule. In Phase 2, determination of site-specific groundwater limitations to be adopted in WDRs will depend upon the Board's evaluation of the results of the tasks. The numerical implementation of many Basin Plan narrative water quality objectives in Phase 1, in accord with the procedures prescribed in the Basin Plan, represents the threshold above which there will be adverse impacts on beneficial uses of groundwater (e.g., drinking water MCLs). Since the proposed Order implements existing water quality objectives, the Board is not required to undertake further consideration of the factors in Water Code section 13241, including economic considerations.

The proposed Order carries over the previous permit's prohibitions, including the prohibition of direct discharge to the Kings River when the ratio of river flow to wastewater discharge is less than 100:1. The proposed Order also prohibits the recycling of WWTF effluent to areas lacking Board-adopted water recycling requirements or waiver of said requirements.

The effluent limits prescribed in the proposed Order for BOD_5, TSS, settleable solids, chlorine residual, total coliform organisms, pH, and acute toxicity, are carried over from the previous permit with one exception. The proposed Order requires 80 percent removal of influent BOD_5 and TSS for discharge to ponds (Discharge 001). The proposed Order's discharge specifications regarding dissolved oxygen and freeboard are consistent with Board policy for the prevention of nuisance conditions, and are applied to all such facilities. The proposed Order's receiving water limitations are based on the Basin Plan and are carried over from the previous permit.

The proposed Order also requires the Discharger to implement best practicable treatment and control (BPTC). While the Discharger's current management of its sludge drying and biosolids disposal processes appear to be BPTC, groundwater degradation resulting from the Discharger's historical use of sludge drying beds and lagoons was not consistent with the State Antidegradation Policy. Compliance with the various water quality objectives necessary to protect present and future beneficial uses within the aquifer should be determined by water representative of the depth of the uppermost zone. The proposed Order does not require the Discharger to determine the extent of groundwater pollution associated with the former sludge drying process, as this was requested by the Board-issued NOV dated 9 May 2001 described previously. The Discharger will submit a proposal for groundwater remediation that will likely be incorporated as tasks and time schedule in a future enforcement action.

PERMIT LIMITATIONS

Discharge limits are primarily based on the Basin Plan. Further, federal regulations require that NPDES permit effluent limitations must control all pollutants which are or may be discharged at a level which will cause or have the reasonable potential to cause or contribute to an in-stream excursion above any state water quality standard, including any narrative criteria for water quality (40 CFR 122.44(d)(1)(i)). In allowing a discharge to occur and in prescribing appropriate conditions for the discharge, the Board must comply with CWC section 13263 in setting conditions.

Conventional Pollutants. Pursuant to 40 CFR sections 133.102(a) and (b) for Discharge 002 (direct river discharge), the proposed Order requires a monthly average 85 percent removal of influent BOD_5 and total suspended solids (TSS), establishes respective limitations for monthly average BOD_5 and TSS in WWTF effluent of 10 mg/L, and stipulates that the river discharge shall not have a pH less than 6.0 or greater than 9.0. These effluent limitations for direct river discharge are carried over from the previous permit. Pursuant to the Basin Plan for Discharge 001 (land discharge), the proposed Order requires a monthly average 80 percent removal of influent BOD_5 and TSS, establishes respective limitations for monthly average BOD_5 and TSS in WWTF effluent of 40 mg/L, and stipulates that the land discharge shall not have a pH less than 6.5 or greater than 9.5. All these effluent limitations are carried over from the previous permit with the exception of the 80 percent BOD_5 and TSS removal requirement. The Discharger indicates that during periods when influent BOD_5 is low (e.g., below 140 mg/L), that it may not be able to consistently achieve 80 percent BOD_5 removal. The proposed Order requires the Discharger to conduct a comprehensive evaluation of each major component of the WWTF's waste treatment and disposal systems. This evaluation should identify treatment design and/or operation modifications necessary to achieve consistent compliance with the 80 percent BOD_5 and TSS requirement. The proposed Order carries over the previous permit's requirement of 85 percent removal of influent BOD_5 and TSS for direct discharge to the Kings River (Discharge 002). Because of the infrequency of direct river discharge, there is limited data to assess the Discharger's ability to comply with the 85 percent reduction requirement. The proposed Order also stipulates that the discharge (either to river or to land) shall not have an EC over source water EC plus 500 µmhos/cm, or 1,000 µmhos/cm, whichever is less. While the source water plus EC limitation is carried over from the previous permit, the 1,000 µmhos/cm maximum EC is a new specification that is necessary to protect beneficial uses of area groundwater.

Coliform Limit. The effluent limitations for 7-day median and daily maximum total coliform organisms are established at 23 and 240 MPN/100 mL, respectively, and reflect standard disinfected secondary treatment performance. The coliform limits have been in the Discharger's previous permits and section 402(o) of the Clean Water Act establishes express statutory language prohibiting the backsliding of effluent limitations. The beneficial uses downstream of the discharge are generally restricted to municipal and domestic supply, industrial process and agricultural supply; water contact and noncontact recreation; warm fresh water habitat; wildlife habitat, and groundwater recharge. The level of disinfection prescribed by this Order is protective of these beneficial uses, assures that the discharge will not cause or contribute to cause exceedances of the water quality objective for fecal coliform in the receiving water, and assures compliance with section 402(o) of the Clean Water Act.

No Available Dilution in Effluent Limitation Determination. In determining whether a discharge has the reasonable potential to contribute to an in-stream excursion above any State water quality standard, including any narrative criteria, the dilution of the effluent in the receiving water may be considered where areas of dilution are defined. The available dilution may also be used to calculate protective effluent limitations by applying water quality criteria at the edge of the defined mixing zone. These calculations include receiving water pollutant concentrations that are typically based on worst-case conditions for flow and concentration. If limited or no dilution is available, the effluent limitations are set equal to the applicable water quality criteria that are applied at the end-of-pipe so the discharge will not cause the receiving stream to exceed water quality objectives established to protect beneficial uses.

The current Order requires a minimum dilution flow ratio of 100:1 (Kings River:Discharge 002). This ratio meets or exceeds the California Department of Health Services guidelines for wastewater disinfection when discharged to freshwater streams and rivers. This proposed Order maintains that requirement.

Toxicity Receiving Water Limitation and Chronic Toxicity Testing. The proposed Order updates the chronic toxicity testing to be consistent with EPA procedures. The testing, to determine whether the effluent is contributing toxicity to the Kings River, must be conducted as specified in EPA 600/4-91-002. EPA recommends conducting chronic toxicity testing if the dilution of the effluent is less than 100:1 (receiving water:effluent). The ratio of receiving water to WWTF effluent discharged to the Kings River ranged from 1,500:1 to over 3,000:1 in 1998. According to EPA guidelines, chronic toxicity is based on a criteria of $TU_C \leq 1$, where $TU_C = 100/NOEL$ (No Observed Effect Level). This means that a no adverse effect level would need to be exhibited on an undiluted effluent. If dilution of the effluent is needed to achieve a no adverse effect level, the test result would be in violation of the chronic toxicity criteria.

Determining Reasonable Potential for nonpriority pollutants. EPA has developed ambient water quality criteria for the protection of aquatic life as recommended limitations to protect against toxicity. Staff reviewed EPA's ambient water quality criteria as a means of deriving numeric limitations to protect the receiving stream from toxicity. Based on information submitted in monitoring reports and in studies, the discharge has a reasonable potential to cause or contribute to an in-stream excursion above the Basin Plan's narrative water quality objective for toxicity due to residual chlorine. Effluent limitations for these constituents are included in this permit, as discussed in detail below.

Residual Chlorine. The existing permit limits the discharge to a daily maximum chlorine residual concentration of 0.1 mg/L and requires that the discharge not cause detectable concentrations of residual chlorine in the receiving water . To protect aquatic organisms, EPA's Ambient Water Quality Criteria for chlorine recommends that the four-day average total residual chlorine concentration not exceed 0.011 mg/L and the one-hour average concentration not exceed 0.019 mg/L. The Discharger's weekly monitoring of the receiving water for chlorine residual in 1998 showed residual chlorine to be nondetect. Because of dilution provided by the Kings River during periods when direct discharge is allowed, the proposed Order's effluent chlorine residual limitation of 0.1 mg/L is adequately protective of fish and aquatic life in the receiving water and sufficient to maintain the water quality objective for toxicity.

Determining Reasonable Potential for Priority Pollutants. For priority pollutants, guidance regarding determination of reasonable potential, effluent limits, and compliance schedules is covered by the *Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California*, adopted in March 2000 by the State Board, hereafter referred to as the State Implementation Plan (SIP). The numeric water quality criteria for priority pollutants were adopted by EPA with the promulgation of the California Toxics Rule. The Discharger began a monitoring program to comply with the Policy for Implementation of Toxics Standards for Inland Surface Waters pursuant to

Board letter dated 27 February 2001. The program consists of quarterly sampling for priority pollutants for one year, semiannual sampling for organo-phosphate pesticides for one year, and wet and dry season sampling for dioxins and congeners for the next three years. The Discharger has submitted data from the first two sampling events. The data indicates a potential for toxicity of the river for copper and lead upstream of the WWTF discharge point due to the extremely low hardness of the river (7.5 mg/L measured in July 2001). Because the hardness of the river is so variable and low, the proposed Order requires quarterly monitoring for hardness during the first year following adoption to make a final determination of reasonable potential. Provision J.6 provides for the Board to reopen the Order if necessary.

RECEIVING WATER LIMITATIONS

The Board is required, relative to surface water and the groundwater that may be affected by the discharge, to implement the Basin Plan and consider the beneficial uses to be protected along with the water quality objectives essential for that purpose. The Board need not authorize the full utilization of the waste assimilation capacity of the receiving waters (CWC section 13263(b)) and must consider other waste discharges and factors that affect that capacity. The Antidegradation Policy requires the maintenance of the existing high quality (i.e., "background") of surface waters and groundwaters unless a change in water quality can be found as "consistent with maximum benefit to the people of the State." Maintenance of the existing high quality of water means maintenance of "background" water quality conditions and defines the most stringent limits that could possibly apply in this situation. Water quality objectives define the least stringent limits that could apply as water quality limitations for receiving waters at this location, except where background quality unaffected by the discharge already exceeds the objective.

Receiving Water Limits – Surface Water. Receiving Water Limitations E.1 through E.18 are found in the Basin Plan and deal with general receiving surface water parameters. The Basin Plan indicates that in determining compliance with the surface water quality objective for pH, averaging periods are appropriate provided that beneficial uses will be fully protected.

Receiving Water Limits – Groundwater. The proposed Order prescribes groundwater limitations that reflect numerical and narrative water quality objectives (WQOs) for groundwater established in the Basin Plan. The proposed Order requires the discharge not to cause or contribute to exceedances of the groundwater limitations. Designated beneficial uses of area groundwater include municipal (MUN) and agricultural (AGR) supply. The Basin Plan states that "[w]ater quality objectives apply to all waters within a surface or ground water resource for which beneficial uses have been designated, rather than at an intake, wellhead or other point of consumption." Groundwater WQOs include (1) chemical constituents (including pesticides and radioactivity), (3) salinity, (4) tastes and odors, and (5) toxicity. For groundwaters designated MUN, the Basin Plan establishes numerical WQOs for bacteria and chemical constituents. The latter consists of drinking water maximum contaminant levels (MCLs) in

Title 22, sections 64431 (Inorganic Chemicals); 64431 (Fluoride); 64443 (Radioactivity) 64444 (Organic Chemicals); 64449 (Secondary MCLs – Consumer Acceptance Limits); and lead not to exceed 0.015 mg/L.

The proposed Order prescribes groundwater limitations that reflect water quality objectives for protecting the beneficial uses of area groundwater and requires the Discharger to conduct a BPTC evaluation of the discharge (including source control, pretreatment, and treatment). The total coliform organism limitation of 2.2 MPN/100 mL in Groundwater Limitation G.1.a is based on the Basin Plan's WQO (i.e., the concentration of TCO over any 7-day period shall be less than 2.2/100 mL). Groundwater Limitation G.1.b prescribes a value of 10 mg/L as total nitrogen to ensure that groundwater nitrate levels will remain at or below the Title 22 primary drinking water MCL for nitrate (45 mg/L as nitrate or 10 mg/L as N). The limitations for chemical constituents prescribed in Groundwater Limitation G.1.c reflect the Title 22 drinking water MCLs.

Groundwater Limitation G.2 prescribes limits for boron, chloride, EC, sodium, and TDS to protect existing and future beneficial uses of area groundwater for agriculture. The majority of area agriculture water supply is currently delivered via flood irrigation. Once it completes its BPTC evaluation, the Discharger may, at its discretion, propose for Board consideration site-specific, constituent-specific limits for salinity constituents (e.g., chloride, EC, sodium, and TDS). In the next Order regulating the discharge, the Board will evaluate the Discharger's justification of BPTC implementation and its proposed groundwater salinity limitations. It is possible upon further documentation and analysis that the discharge may be found not to be causing degradation from these waste constituents, but if it is the resulting degradation from salt can probably be found consistent with Resolution 68-16. The Discharger questions the applicability of the 0.5 mg/L ammonia value for use as a receiving water limitation for taste-producing substances as it is not a DHS-promulgated Secondary MCL for drinking water. However, the Basin Plan indicates on page IV-22 that, for taste- and odor-producing substances, the Board may evaluate concentrations of pollutants in water with numerical taste and odor thresholds that have been published by other agencies. Board staff recommends that the term "agencies" includes the entity responsible for promulgating European Union drinking water standards.

The last two groundwater limitations reflect narrative WQOs contained in the Basin Plan. Groundwater Limitation G.3 implements the Basin Plan's WQO for taste and odor. The taste threshold for ammonia, a waste constituent in municipal wastewater, is 0.5 mg/L. The limitation of 0.5 mg/L for ammonia ensures that this waste constituent will not adversely affect the beneficial use of area groundwater for human consumption. Lastly, Groundwater Limitation G.4 implements the Basin Plan's WQO for toxicity.

MONITORING AND REPORTING REQUIREMENTS

Section 13267 of the CWC authorizes the Board to require monitoring and technical reports as necessary to investigate the impact of a waste discharge on waters of the state. In recent years, there has been increased emphasis on obtaining all necessary information, assuring the information is timely as well as representative and accurate, and thereby improving accountability of any discharger for meeting the conditions of discharge. Section 13268 of the CWC authorizes assessment civil administrative liability where appropriate.

The proposed Order requires influent monitoring of settleable solids, pH, EC, BOD_5, and TSS, and effluent monitoring of pH, BOD_5, TSS, settleable solids, TDS, EC, ammonia, nitrite, nitrate, TKN, total nitrogen, oil and grease, general minerals, metals, and priority pollutants. Effluent monitoring of these constituents is necessary to check compliance with various discharge specifications. The proposed Order's influent monitoring is consistent with recently adopted Board Orders for municipal facilities with significant industrial users and especially those without Board approved industrial pretreatment programs. The Board may consider reducing the number of constituents and monitoring frequency when the City obtains Board approval of its industrial pretreatment program.

The proposed Order also includes groundwater, supply water, and sludge monitoring. The monitoring is necessary to evaluate groundwater quality and the extent of the degradation and pollution from the discharge. The proposed Order includes monitoring of recycling activities to check compliance with Title 22 and the terms and conditions of this Order. The proposed Order contains influent and effluent monitoring of all constituents that required monitoring in the previous Order, and adds influent monitoring for pH, EC, and settleable solids; and effluent monitoring for nitrite, nitrate, ammonia, TKN, metals (except for silver carried over from the previous Order), and priority pollutants. The addition of metals and priority pollutants is to develop a more accurate characterization of the discharge, while the addition of the different nitrogen forms is to characterize and quantify the amount of nitrogen loading. To determine if the Discharger is in compliance with General Discharge Specification B.3.a (EC Limitation), it is required to monitor its source water quarterly for EC for the first year following Order adoption and annually thereafter. To determine the efficiency of the Discharger's operation, the Discharger is required to monitor influent daily for settleable solids, pH, and EC and weekly for BOD_5 and TSS. In order to adequately characterize its wastewater effluent, the Discharger is required to monitor daily for settleable solids, and pH; three times weekly for EC, three times weekly for TSS and BOD_5 when discharge is to the Kings River; weekly for TSS, BOD_5 and TDS; weekly for nitrogen constituents for the first three months, twice monthly thereafter until the Discharger receives written approval from the Executive Officer to reduce frequency to once monthly; monthly for oil and grease; quarterly for general minerals and metals; and semiannually for priority pollutants. To monitor storage ponds for capacity constraints and potential nuisance conditions, the Discharger is required to monitor available freeboard daily and dissolved oxygen content as required to monitor for odorous nuisance conditions.

The proposed Order requires the Discharger to monitor sludge at least semiannually and sample sludge in accordance with EPA's *POTW SLUDGE SAMPLING AND ANALYSIS GUIDANCE DOCUMENT, AUGUST 1989,* and test for arsenic, cadmium, chromium, copper, lead, mercury, molybdenum, nickel, selenium, silver and zinc. Silver is added for a period of one year following Board approval of the City's industrial pretreatment program. The proposed Order requires the Discharger to characterize sludge for priority pollutants listed in 40 CFR 122 Appendix D, Tables II and III (excluding total phenols). The resulting data will be evaluated by the Discharger and Board staff in assessing the potential effects of priority pollutants in the effluent and the receiving water. The proposed Order also requires the Discharger to submit an annual summary of sludge production and discharge operations.

The proposed Order requires the Discharger to evaluate the uppermost aquifer for a representative zone against which groundwater limitations will be applied. The proposed Order requires installation of an effective monitoring network that includes wells in the uppermost aquifer. One or more wells will monitor the quality of groundwater unaffected by the discharge and serve as 'background' water quality. The proposed Order requires the Discharger to evaluate the uppermost aquifer for a representative zone or zones for evaluation of compliance with groundwater limitations. The approved representative zones of the aquifer will be identified in the hydrogeologic investigation described in Provision J.7. Wells must be installed to measure the quality of water within these zones for comparison with groundwater limitations as part of the proposed Order. The proposed Order provides a schedule for proposing, then providing the monitoring network, for these representative zones. Until the network is installed, the Board cannot adequately evaluate compliance with groundwater limitations. Use of existing groundwater monitoring wells will continue for the purposes of monitoring the effects of the discharge on the uppermost layer of groundwater until an alternate network suitable for evaluating the effectiveness of BPTC and compliance with groundwater limitations is approved by the Executive Officer in accord with the process outlined in the proposed Order.

CEQA AND ANTIDEGRADATION CONSIDERATIONS

The action to adopt an NPDES permit is exempt from the provisions of Chapter 3 of the California Environmental Quality Act (CEQA) (Public Resources Code section 21000 et seq.), in accordance with section 13389 of the California Water Code.

This proposed NPDES permit is consistent with the Clean Water Act and water quality objectives contained in the Basin Plan. The permitted discharge to the Kings River is an existing surface water discharge consistent with the antidegradation provisions of 40 CFR 131.12 and the Antidegradation Policy. The treatment process incorporates technology for secondary treatment of the City's municipal wastewater, provides for biosolids handling and treatment for reuse, and incorporates a disinfection process to protect surface water quality. Control measures include an inflow and infiltration (I/I) rehabilitation program and a capital recovery fund. It also includes a current O&M manual and sufficient staffing to assure proper operation and maintenance.

This proposed Permit requires the Discharger to initiate an Antidegradation Analysis to determine what modifications are necessary, and an implementation schedule, to raise its effluent disposal operations to a standard that reflects BPTC consistent with the State Antidegradation Policy. The proposed Order requires quarterly monitoring for total coliform organisms from at least one well in the disposal ponds vicinity, that well to be proposed by the Discharger and subject to Executive Officer approval. The Discharger has indicated the need to install dedicated sampling equipment and requested the Board approve sampling from only one well. This request seems reasonable in light of the historical data from four monitoring wells in the area of the ponds that indicate groundwater to be unaffected by coliform bacteria. Monitoring of additional wells will be required if any sampling event indicates the presence of coliform bacteria.

Reopener

The conditions of discharge in the proposed Order were developed based on currently available technical information and applicable water quality laws, regulations, policies, and plans, and are intended to assure conformance with them. However, information is presently insufficient to develop final effluent and groundwater limitations, so the proposed Order sets limitations for the interim while site-specific, constituent-specific limits are developed in conjunction with a BPTC evaluation, including source control and pretreatment. Additional information must be developed and documented by the Discharger as required by schedules set forth in the proposed Order. As this additional information is obtained, decisions will be made concerning the best means of assuring the highest water quality possible that could involve substantial cost. It may be appropriate to reopen the Order if applicable laws and regulations change, but the mere possibility that such laws and regulations may change is not sufficient basis for reopening the Order. The CWC requires that waste discharge requirements implement all applicable requirements.

Several other more likely reasons for reconsidering terms of the Order exist, and the Order may be opened for this purpose at the Board's discretion. Procedures require periodic review of the effectiveness of requirements at a frequency proportional to the threat the discharge has to water quality. The Order will be reopened for consideration of BPTC and establishing final numeric groundwater limitations. It is also conceivable that monitoring compliance may identify a waste constituent, possibly a toxic waste constituent, that violates or threatens to violate groundwater limitations, establishing a need to consider an appropriate numeric effluent limit for that waste constituent.

Enforcement Action

The proposed Order and this Information Sheet describe how past on-site sludge handling practices caused pollution with nitrates and degradation for salinity waste constituents. The proposed Order lays out a schedule to assure full implementation of BPTC that will assure that the ongoing discharge does not create a condition of pollution or of nuisance and that the highest water quality will be maintained. If the Discharger complies with the specifications of the proposed Order, then ongoing adverse impacts to groundwater should be mitigated to the extent that it is consistent with the antidegradation provisions of Resolution No. 68-16. However, this does not address the problems created by past practices and thus far reflect inadequate actions by the Discharger to define the pollution and address remediation. A separate enforcement action will be proposed for Board consideration at a later date.

DSS/jlk:12/7/01

APPENDIX B - APPLICABLE ADJUSTED WATER QUALITY CRITERIA FOR THE KINGS RIVER

Table 1 Applicable Adjusted Water Quality Criteria (Continued)
Reasonable Potential Analysis
City of Reedley

CTR #	Compound	Lowest Applicable Criteria	Units	CTR #	Compound	Lowest Applicable Criteria	Units	CTR #	Compound	Lowest Applicable Criteria	Units
69	4-Bromophenyl phenyl ether	N/A	ug/L	89	Hexachlorobutadiene	0.44	ug/L	109	4,4-DDE	0.00059	ug/L
70	Butylbenzyl Phthalate	3000	ug/L	90	Hexachlorocyclopentadiene	50	ug/L	110	4,4-DDD	0.00083	ug/L
71	2-Chloronaphthalene	1700	ug/L	91	Hexachloroethane	1.9	ug/L	111	Dieldrin	0.00014	ug/L
72	4-Chlorophenyl phenyl ether	N/A	ug/L	92	Indeno(123cd)Pyrene	0.0044	ug/L	112	a-Endosulfan	0.056	ug/L
73	Chrysene	0.0044	ug/L	93	Isophorone	8.4	ug/L	113	b-Endosulfan	0.056	ug/L
74	Dibenzo(ah)Anthracene	0.0044	ug/L	94	Naphthalene	N/A	ug/L	114	Endosulfan Sulfate	110	ug/L
75	1,2-Dichlorobenzene	600	ug/L	95	Nitrobenzene	17	ug/L	115	Endrin	0.036	ug/L
76	1,3-Dichlorobenzene	400	ug/L	96	n-Nitrosodimethylamine	0.00069	ug/L	116	Endrin Aldehyde	0.76	ug/L
77	1,4-Dichlorobenzene	5	ug/L	97	n-Nitroso-di-n-Propylamine	0.005	ug/L	117	Heptachlor	0.00021	ug/L
78	3,3-Dichlorobenzidine	0.04	ug/L	98	n-Nitrosodiphenylamine	5	ug/L	118	Heptachlor Epoxide	0.0001	ug/L
79	Diethyl Phthalate	23000	ug/L	99	Phenanthrene	N/A	ug/L	119	PCB 1016	0.00017	ug/L
80	Dimethyl Phthalate	313000	ug/L	100	Pyrene	960	ug/L	120	PCB 1221	0.00017	ug/L
81	di-n-Butyl Phthalate	2700	ug/L	101	1,2,4-Trichlorobenzene	70	ug/L	121	PCB 1232	0.00017	ug/L
82	2,4-Dinitrotoluene	0.11	ug/L	102	Aldrin	0.00013	ug/L	122	PCB 1242	0.00017	ug/L
83	2,6-Dinitrotoluene	N/A	ug/L	103	a-Hexachlorocyclohexane (a-BHC)	0.0039	ug/L	123	PCB 1248	0.00017	ug/L
84	di-n-Octyl Phthalate	N/A	ug/L	104	b-Hexachlorocyclohexane (b-BHC)	0.014	ug/L	124	PCB 1254	0.00017	ug/L
85	1,2-Diphenylhydrazine	0.04	ug/L	105	Lindane (g-BHC)	0.019	ug/L	125	PCB 1260	0.00017	ug/L
86	Fluoranthene	300	ug/L	106	d-Hexachlorocyclohexane (d-BHC)	N/A	ug/L	126	Toxaphene	0.0002	ug/L
87	Fluorene	1300	ug/L	107	Chlordane	0.00057	ug/L				
88	Hexachlorobenzene	0.00075	ug/L	108	4,4-DDT	0.00059	ug/L		Minimum Hardness	43.9	mg/L

Table 1 Applicable Adjusted Water Quality Criteria
Reasonable Potential Analysis
City of Reedley

CTR #	Compound	Lowest Applicable Criteria	Units	CTR #	Compound	Lowest Applicable Criteria	Units	CTR #	Compound	Lowest Applicable Criteria	Units
1	Antimony	6	ug/L	23	Chlorodibromomethane	0.41	ug/L	46	2,4-Dichlorophenol	93	ug/L
2	Arsenic	50	ug/L	24	Chloroethane	N/A	ug/L	47	2,4-Dimethylphenol	540	ug/L
3	Beryllium	4	ug/L	25	2-Chloroethyl Vinyl Ether	N/A	ug/L	48	4,6-Dinitro-2-methylphenol	13.4	ug/L
4	Cadmium	1.3	ug/L	26	Chloroform	5.7	ug/L	49	2,4-Dinitrophenol	70	ug/L
5a	Chromium III	105	ug/L	27	Dichlorobromomethane	0.56	ug/L	50	2-Nitrophenol	N/A	ug/L
5b	Chromium VI	11	ug/L	28	1,1-Dichloroethane	5	ug/L	51	4-Nitrophenol	N/A	ug/L
6	Copper	4.6	ug/L	29	1,2-Dichloroethane	0.38	ug/L	52	4-Chloro-3-methylphenol	N/A	ug/L
7	Lead	1.1	ug/L	30	1,1-Dichloroethene	0.057	ug/L	53	Pentachlorophenol	0.28	ug/L
8	Mercury	0.05	ug/L	31	1,2-Dichloropropane	0.52	ug/L	54	Phenol	21000	ug/L
9	Nickel	26	ug/L	32	1,3-Dichloropropane	10	ug/L	55	2,4,6-Trichlorophenol	2.1	ug/L
10	Selenium	5	ug/L	33	Ethylbenzene	700	ug/L	56	Acenaphthene	1200	ug/L
11	Silver	4.7	ug/L	34	Bromomethane	48	ug/L	57	Acenaphthylene	N/A	ug/L
12	Thallium	1.7	ug/L	35	Chloromethane	N/A	ug/L	58	Anthracene	9600	ug/L
13	Zinc	60	ug/L	36	Dichloromethane	4.7	ug/L	59	Benzidine	0.00012	ug/L
14	Cyanide	5.2	ug/L	37	1,1,2,2-Tetrachloroethane	0.17	ug/L	60	1,2-Benzanthracene	0.0044	ug/L
15	Asbestos	7000000	#/L	38	Tetrachloroethene	0.8	ug/L	61	Benzo(a)Pyrene	0.0044	ug/L
16	Dioxin and Congeners	0.000013	ng/L	39	Toluene	150	ug/L	62	3,4-Benzofluoranthene	0.0044	ug/L
17	Acrolein	320	ug/L	40	trans-1,2-Dichloroethylene	10	ug/L	63	Benzo(ghi)Perylene	N/A	ug/L
18	Acrylonitrile	0.059	ug/L	41	1,1,1-Trichloroethane	200	ug/L	64	Benzo(k)Fluoranthene	0.0044	ug/L
19	Benzene	1	ug/L	42	1,1,2-Trichloroethane	0.6	ug/L	65	bis-2-(1-Chloroethoxyl)Methane	N/A	ug/L
20	Bromoform	4.3	ug/L	43	Trichlorothene	2.7	ug/L	66	bis(2-Chloroethyl)Ether	0.031	ug/L
21	Carbon Tetrachloride	0.25	ug/L	44	Vinyl Chloride	0.5	ug/L	67	bis(2-Chloroisopropyl)Ether	1400	ug/L
22	Chlorobenzene	70	ug/L	45	2-Chlorophenol	120	ug/L	68	bis(2-Ethylhexyl)Phthalate	1.8	ug/L

APPENDIX C - WATER REUSE MATRIX

Recycled Water Uses Allowed* In California

This summary is prepared for **WateReuse Association**, from the December 2, 2000, Title-22 adopted **Water Recycling Criteria**, and supersedes all earlier versions

Use of Recycled Water	Treatment Level			
	Disinfected Tertiary Recycled Water	Disinfected Secondary-2.2 Recycled Water	Disinfected Secondary-23 Recycled Water	Undisinfected Secondary Recycled Water
Irrigation of:				
Food crops where recycled water contacts the edible portion of the crop, including all root crops	**Allowed**	Not allowed	Not allowed	Not allowed
Parks and playgrounds	**Allowed**	Not allowed	Not allowed	Not allowed
School yards	**Allowed**	Not allowed	Not allowed	Not allowed
Residential landscaping	**Allowed**	Not allowed	Not allowed	Not allowed
Unrestricted-access golf courses	**Allowed**	Not allowed	Not allowed	Not allowed
Any other irrigation uses not prohibited by other provisions of the California Code of Regulations	**Allowed**	Not allowed	Not allowed	Not allowed
Food crops, surface-irrigated, above-ground edible portion, and not contacted by recycled water	**Allowed**	**Allowed**	Not allowed	Not allowed
Cemeteries	**Allowed**	**Allowed**	**Allowed**	Not allowed
Freeway landscaping	**Allowed**	**Allowed**	**Allowed**	Not allowed
Restricted-access golf courses	**Allowed**	**Allowed**	**Allowed**	Not allowed
Ornamental nursery stock and sod farms with unrestricted public access	**Allowed**	**Allowed**	**Allowed**	Not allowed
Pasture for milk animals for human consumption	**Allowed**	**Allowed**	**Allowed**	Not allowed
Nonedible vegetation with access control to prevent use as a park, playground or school yard	**Allowed**	**Allowed**	**Allowed**	Not allowed
Orchards with no contact between edible portion and recycled water	**Allowed**	**Allowed**	**Allowed**	**Allowed**
Vineyards with no contact between edible portion and recycled water	**Allowed**	**Allowed**	**Allowed**	**Allowed**
Non food-bearing trees, including Christmas trees not irrigated less than 14 days before harvest	**Allowed**	**Allowed**	**Allowed**	**Allowed**
Fodder and fiber crops and pasture for animals not producing milk for human consumption	**Allowed**	**Allowed**	**Allowed**	**Allowed**
Seed crops not eaten by humans	**Allowed**	**Allowed**	**Allowed**	**Allowed**
Food crops undergoing commercial pathogen-destroying processing before consumption by humans	**Allowed**	**Allowed**	**Allowed**	**Allowed**
Ornamental nursery stock, sod farms not irrigated less than 14 day before harvest	**Allowed**	**Allowed**	**Allowed**	**Allowed**
Supply for impoundment:				
Nonrestricted recreational impoundments, with supplemental monitoring for pathogenic organisms	**Allowed****	Not allowed	Not allowed	Not allowed
estricted recreational impoundments and publicly accessible fish hatcheries	**Allowed**	**Allowed**	Not allowed	Not allowed
Landscape impoundments without decorative fountains	**Allowed**	**Allowed**	**Allowed**	Not allowed
Supply for cooling or air conditioning:				
Industrial or commercial cooling or air conditioning involving cooling tower, evaporative condenser, or spraying that creates a mist	**Allowed*****	Not allowed	Not allowed	Not allowed
Industrial or commercial cooling or air conditioning not involving cooling tower, evaporative condenser, or spraying that creates a mist	**Allowed**	**Allowed**	**Allowed**	Not allowed
Other uses:				
Groundwater Recharge	**Allowed** under special case-by-case permits by RWQCBs****			
Flushing toilets and urinals	**Allowed**	Not allowed	Not allowed	Not allowed
Priming drain traps	**Allowed**	Not allowed	Not allowed	Not allowed
Industrial process water that may contact workers	**Allowed**	Not allowed	Not allowed	Not allowed
Structural fire fighting	**Allowed**	Not allowed	Not allowed	Not allowed
Decorative fountains	**Allowed**	Not allowed	Not allowed	Not allowed
Commercial laundries	**Allowed**	Not allowed	Not allowed	Not allowed
Consolidation of backfill material around potable water pipelines	**Allowed**	Not allowed	Not allowed	Not allowed
Artificial snow making for commercial outdoor uses	**Allowed**	Not allowed	Not allowed	Not allowed
Commercial car washes, not heating the water, excluding the general public from washing process	**Allowed**	Not allowed	Not allowed	Not allowed
Industrial process water that will not come into contact with workers	**Allowed**	**Allowed**	**Allowed**	Not allowed
Industrial boiler feed	**Allowed**	**Allowed**	**Allowed**	Not allowed
Nonstructural fire fighting	**Allowed**	**Allowed**	**Allowed**	Not allowed
Backfill consolidation around nonpotable piping	**Allowed**	**Allowed**	**Allowed**	Not allowed
Soil compaction	**Allowed**	**Allowed**	**Allowed**	Not allowed
Mixing concrete	**Allowed**	**Allowed**	**Allowed**	Not allowed
Dust control on roads and streets	**Allowed**	**Allowed**	**Allowed**	Not allowed
Cleaning roads, sidewalks and outdoor work areas	**Allowed**	**Allowed**	**Allowed**	Not allowed
Flushing sanitary sewers	**Allowed**	**Allowed**	**Allowed**	**Allowed**

* Refer to the full text of the December 2, 2000 version of Title-22: California Water Recycling Criteria. This chart is only an informal summary of the uses allowed in this version.
'he complete and final 12/02/2000 version of the adopted criteria can be downloaded from : <http://www.dhs.ca.gov/ps/ddwem/publications/Regulations/recycleregs_index.htm>

** With "conventional tertiary treatment". Additional monitoring for two years or more is necessary with direct filtration.

*** Drift eliminators and/or biocides are required if public or employees can be exposed to mist.

**** Refer to Groundwater Recharge Guidelines, available from the California Department of Health Services.

Prepared by Bahman Sheikh and edited by EBMUD Office of Water Recycling, who acknowledge this is a summary and not the formal version of the regulations referenced above

APPENDIX D - MEMO FROM GARY YAMAMOTO, P.E., AND JAMES WADDELL, DEPARTMENT OF HEALTH SERVICES, TO CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARDS, JANUARY 8, 2003.

State of California—Health and Human Services Agency

Department of Health Services

TO: D. Steringfield	FROM: Amando Garza	DATE: / / PAGES INCLUDING THIS PAGE:
FAX #: FNO	FAX #: BKO	PHONE #:

California Department of Health Services
DIANA M. BONTÁ, R.N., Dr. P.H.
Director

GRAY DAVIS
Governor

January 8, 2003

TO: State of California
Regional Water Quality Control Boards

SUBJECT: Orchard and Vineyard Irrigation Using Recycled Water

This memo is being sent to provide you with clarification concerning the application of recycled water on orchard and vineyard crops based on the current position of the California Department of Health Services Food and Drug Branch (FDB). General guidance is also presented for developing permit conditions for existing and proposed projects involving orchard and vineyard crops identified under Section 60340 (d) of the Water Recycling Criteria.

Section 60304(d) of the Criteria allows for the use of undisinfected secondary recycled water for prescribed applications involving limited food and seed crops, subject to certain restrictions. Such applications are limited to 1) Orchards and Vineyards where the recycled water does not come into contact with the edible portion of the food crop, 2) seed crops not eaten by humans, and 3) food crops that must undergo commercial pathogen destroying processing before being consumed by humans. The FDB, with the concurrence of the Division of Drinking Water and Environmental Management (DDWEM) believes that undisinfected secondary effluent represents a potential public health threat when direct or indirect modes of public contact with the recycled water, or a food product having been directly exposed to the recycled water, is allowed to occur.

It is the position of the FDB that orchard and vineyard crops will quite likely come into contact with recycled water or soil irrigated with recycled water through typical harvesting practices (e.g. sweeping of nuts shaken from trees) and/or improper use-site control measures (e.g. harvesting of grounders). Furthermore, FDB has reported that recent studies have indicated there may be a potential for pathogens to gain access to the interior of fruits or seeds through uptake by the root system, breaks in the surface of the food product and stem scars. As a result, the FDB recommends that orchard and vineyard crops are irrigated with water, which (at a minimum) meets the requirements of a disinfected secondary-2.2 recycled water as defined in Section 60301.220. Furthermore, it is the position of FDB that the coliform standard be achieved using chlorine as the disinfectant due to limited data available on the effectiveness of other

Division of Drinking Water and Environmental Management, Recycled Water Unit
1180 Eugenia Place, Suite 200, Carpinteria, California 93013
(805) 566-9767; (805) 745-8196 fax
Internet Address: www.dhs.ca.gov/ps/ddwem/

disinfectants on secondary effluent and a general lack of experience with their use. If a project proponent wishes to use an alternative disinfectant, they would need to demonstrate equivalency to microbial inactivation using chlorine to achieve a 7-day median 2.2 MPN.

The Criteria require the submittal of an engineering report for all proposed projects. In accordance with Section 60323 of the Criteria, the report must (in part) "clearly indicate the means for compliance with these regulations and any other features specified by the regulatory agency". The DDWEM has developed comprehensive guidelines for preparation of such reports to assist the industry in addressing the finite elements of the Criteria. If convincing documentation of how compliance with requirements of Section 60304 (d) will be assured at all times is not provided, FDB recommendation would be for project denial or that minimum treatment requirements be imposed which comply with the disinfected secondary-2.2 recycled water requirement.

It is noted that the existing Water Recycling Criteria prescribe minimum treatment and use-site requirements. They do not preclude regulatory agencies from imposing more stringent treatment and/or use site controls if deemed necessary for public health protection. Additionally, by memorandum dated January 19, 1998 (copy attached), DDWEM field staff was advised that some proposed uses of recycled water might require the review and approval of other agencies having jurisdiction over the use. This memorandum directed staff to ensure that all appropriate agencies are notified of recycled water proposals to ensure them the opportunity to review and comment on the proposal. In the case of food crops, the FDB should certainly be advised/consulted prior to permit issuance.

It is important to recognize that this general guidance is specific to orchard and vineyard type crops, and in no way alters the intent of requirements outlined under Section 60340 (a) which applies to food crops where direct contact between the recycled water and the food crop may occur.

If you have any questions concerning this issue, please contact Dr. Chang-Rae Lee with the FDB at (916) 327-8041 or Jeff Stone with DDWEM at (805) 566-9767.

Sincerely,

Gary Yamamoto, P.E., Chief
Technical Programs Branch
Division of Drinking Water
and Environmental Management

James M. Waddell, Chief
Food and Drug Branch
Division of Food, Drug
and Radiation Safety

cc: State Water Resources Control Board-Rich Mills
Regional/District Engineers
CCDEH

APPENDIX E - BIOSOLIDS CRITERIA FOR LAND APPLICATION

Table E.1 Biosolids Pollutant Concentration Limits for Land Application
Wastewater Treatment Plant Master Plan
City of Reedley

Pollutant	California General Order Ceiling Limits (mg/kg)(1)	503.13 Table 1 Ceiling Concentrations (mg/kg)(1)	503.13 Table 3 High Quality Pollutant Concentrations (mg/kg)(1)
Arsenic	75	75	41
Cadmium	85	85	39
Copper	4,300	4,300	1,500
Lead	840	840	300
Mercury	57	57	17
Molybdenum	75	75	NA(2)
Nickel	420	420	420
Selenium	100	100	100
Zinc	7,500	7,500	2,800

Notes:
1. Dry weight basis.
2. Temporarily suspended by EPA pending further consideration. Value was 18 mg/kg.

Table E.2 Annual and Cumulative Land Application Rates
Wastewater Treatment Plant Master Plan
City of Reedley

Pollutant	California General Order Cumulative Pollutant Loading Rate (lbs/acre)	503.13 Table 2 Cumulative Pollutant Loading Rate (kg/hectare)	503.13 Table 4 Annual Pollutant Loading Rate (kg/hectare)
Arsenic	36	41	2.0
Cadmium	34	39	1.9
Copper	1,336	1,500	75
Lead	267	300	15
Mercury	15	17	0.85
Molybdenum	16	--	--
Nickel	374	420	21
Selenium	89	100	5.0
Zinc	2,494	2,800	140

Table E.3 Class A Pathogen Reduction Alternatives Wastewater Treatment Plant Master Plan City of Reedley	
Alternative	**Description**
A1: Time and Temperature	Fecal coliform shall be less than 1,000 MPN/gram, or Salmonella sp. shall be less than 3 MPN/4 grams of total solids at the time of disposal. Maintain certain temperature and time period based on the percent solids and prescribed equations (see 503 Regulations for details).
A2: Biosolids Treated in a High pH-High Temperature Process	Maintain biosolids at certain elevated temperature and pH for prescribed period of time (see 503 Regulations for details).
A3: Biosolids Treated in Other Processes	The density of enteric viruses in the biosolids after pathogen treatment must be less than 1 PFU per 4 grams of total solids. The density of viable helminth ova in the swage sludge after pathogen treatment must be less than 1 per 4 grams of total solids. Report operating parameters to indicate consistent pathogen reduction treatment.
A4: Biosolids in Unknown Processes	The density of enteric viruses in the biosolids after pathogen treatment must be less than 1 PFU per 4 grams of total solids. The density of viable helminth ova in the sewage sludge after pathogen treatment must be less than 1 per 4 grams of total solids.
A5: Processes to Further Reduce Pathogens (PFRP)	
Composting	Using either the within-vessel composting method or the aerated static pile composting method, the temperature of the sewage sludge is maintained at 55 degrees Celsius or higher for three days. Using the windrow composting method, the temperature of the sewage sludge is maintained at 55 degrees or higher for 15 days or longer. During the period when the compost is maintained at 55 degrees or higher, there shall be a minimum of five turnings of the windrow.

Table E.3 Class A Pathogen Reduction Alternatives
Wastewater Treatment Plant Master Plan
City of Reedley

Alternative	Description
Heat Drying	Sewage sludge is dried by direct or indirect contact with hot gases to reduce the moisture content of the sewage sludge to 10 percent or lower. Either the temperature of the sewage sludge particles exceeds 80 degrees Celsius or the wet bulk temperature of the gas in contact with the sewage sludge as the sewage sludge leaves the dryer exceed 80 degrees Celsius.
Heat Treatment	Liquid sewage sludge is heated to a temperature of 180 degrees Celsius or higher for 30 minutes.
Thermophilic Aerobic Digestion	Liquid sewage sludge is agitated with air or oxygen to maintain aerobic conditions and the mean cell residence time of the sewage sludge is 10 days at 55 to 60 degrees Celsius.
Beta Ray Irradiation	Sewage sludge is irradiated with beta rays from an accelerator at dosages of at least 1.0 megarad at room temperature (ca. 20 degrees Celsius).
Gamma Ray Irradiation	Sewage sludge is irradiated with gamma rays from certain isotopes, such as Cobalt 60 and Cesium 137, at room temperature (ca. 20 degrees Celsius).
Pasteurization	The temperature of the sewage sludge is maintained at 70 degrees Celsius or higher for 30 minutes or longer.
Use of Processes Equivalent to obtain PFRP	Demonstrate operating parameters and/or pathogen levels to be PFRP equivalent subject to permitting authority approval.

Table E.4 Class B Pathogen Reduction Alternatives
Wastewater Treatment Plant Master Plan
City of Reedley

Alternative	Description
B1: Monitoring of Fecal Coliform	The geometric mean of seven samples of treated biosolids, collected at time of use or disposal shall meet a fecal coliform density of less than 2 million colony forming units or most probable number per gram of sewage sludge solids (dry weight basis).
B2: Processes to Significantly Reduce Pathogens (PSRP)	Sewage sludge is treated by one of the five PSRP methods listed below.
Aerobic Digestion	Sewage sludge is agitated with air or oxygen to maintain aerobic conditions for a specific mean cell residence time at a specific temperature. Values for the mean cell residence time and temperature shall be between 40 days at 20 degrees Celsius and 60 days at 15 degrees Celsius.
Air Drying	Sewage sludge is dried on sand beds or on paved or unpaved basins. The sewage sludge dries for a minimum of three months. During two of the three months, the ambient average daily temperature is above zero degrees Celsius.
Anaerobic Digestion	Sewage sludge is treated in the absence of air for a specific mean cell residence time at a specific temperature. Values for the mean cell residence time and temperature shall be between 15 days at 35 to 55 degrees Celsius and 60 days at 20 degrees Celsius.
Composting	Using either the within-vessel, static aerated pile, or windrow composting methods, the temperature of the sewage sludge is raised to 40 degrees Celsius or higher and remains at 40 degrees Celsius or higher for five days. For four hours during the five days, the temperature in the compost pile exceeds 55 degrees Celsius.
Lime Stabilization	Sufficient lime is added to the sewage sludge to raise the pH of the sewage sludge to 12 after two hours of contact.
B3: Use of Processes Equivalent to PSRP	Demonstrate operating parameters and/or pathogen levels to be PSRP equivalent subject to permitting authority approval.

Table E.5	40 CFR 503 Vector Attraction Reduction Requirements Wastewater Treatment Plant Master Plan City of Reedley
Option	**Process**
(1)	The mass of volatile solids in the sewage sludge shall be reduced by a minimum of 38 percent during sewage sludge treatment.
2	When the 38 percent volatile solids reduction requirement cannot be met for an anaerobically digested sewage sludge, vector attraction reduction can be demonstrated by digesting a portion of the previously digested sewage sludge anaerobically in the laboratory in a bench-scale unit for 40 additional days at a temperature between 30 and 37 degrees Celsius. When, at the end of the 40 days, the volatile solids in the sewage sludge at the beginning of that period is reduced by less than 17 percent, vector attraction reduction is achieved.
(3)	When the 38 percent volatile solids reduction requirement in cannot be met for an anaerobically digested sewage sludge, vector attraction reduction can be demonstrated by digesting a portion of the previously digested sewage sludge that has a percent solids of two percent or less aerobically in the laboratory in a bench-scale unit for 30 additional days at 20 degrees Celsius. When, at the end of the 30 days, the volatile solid sin the sewage sludge at the beginning of that period is reduced by less than 15 percent, vector attraction reduction is achieved.
(4)	The specific oxygen uptake rate (SOUR) for sewage sludge treated in an aerobic process shall be equal to or less than 1.5 milligrams of oxygen per hour per gram of total solids (dry weight basis) at a temperature of 20 degrees Celsius.
(5)	Sewage sludge shall be treated in an aerobic process for 14 days or longer. During that time, the temperature of the sewage sludge shall be higher than 40 degrees Celsius and the average temperature of the sewage sludge shall be higher than 45 degrees Celsius.
(6)	The pH of sewage sludge shall be raised to 12 or higher by alkali addition and, without the addition of more alkali, shall remain at 12 or higher for two hours and then at 11.5 or higher for an additional 22 hours at 25 degrees Celsius.
(7)	The percent solids of sewage sludge that does not contain unstabilized solids shall be equal to or greater than 75 percent based on the moisture content and total solids prior to mixing with other materials.
(8)	The percent solids of sewage sludge that contains unstabilized solids generated in a primary wastewater treatment process shall be equal to or greater than 90 percent based on the moisture content and total solids prior to mixing with other materials.
(9)	Sewage sludge shall be injected below the surface of the land. No significant amount of the sewage sludge shall be present on the land surface within one hour after the sewage sludge is injected. When the sewage sludge that is injected below the surface of the land is Class A with respect to pathogens, the sewage sludge shall be injected below the land surface within eight hours after being discharged from the pathogen reduction process.

Table E.5	40 CFR 503 Vector Attraction Reduction Requirements Wastewater Treatment Plant Master Plan City of Reedley
Option	**Process**
(10)	Sewage sludge applied to the land surface or placed on a surface disposal site shall be incorporated into the soil within six hours after application to or placement on the land. When sewage sludge that is incorporated into the soil is Class A with respect to pathogens, the sewage sludge shall be applied to or placed on the land within eight hours after being discharged from the pathogen treatment process.
(11)	Sewage sludge placed on a surface disposal site shall be covered with soil or other material at the end of each operating day.
(12)	The pH of domestic septage shall be raised to 12 or higher by alkali addition and, without the addition of more alkali, shall remain at 12 or higher for 30 minutes at 25 degrees Celsius.

APPENDIX F - PERCOLATION POND CYCLING LOGS FOR 2003 AND 2004

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
JANUARY 2003

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	DRY	DRY	DRY	6.90	3.75	DRY	DRY	
2				6.95	3.80			
3				6.90	3.80			
4				6.90	3.80			
5				6.80	3.70			
6				6.80	3.65			
7				6.85	3.70			
8				6.90	3.80			
9				6.90	3.85			
10				6.90	3.90			
11				6.90	3.90			
12				6.90	3.90			
13				6.90	3.85			
14				6.90	3.85			
15				6.95	3.85			
16				7.00	3.90			
17				7.00	3.85			
18				7.10	3.90			
19				7.05	3.85			
20				7.10	3.85			
21				7.00	3.70			
22				7.00	3.70			
23				7.00	3.65			
24				7.00	3.65			
25				7.00	3.65			
26				6.90	3.65			
27				7.10	3.65			
28				7.10	3.60			
29				7.10	3.65			
30				7.10	3.65			
31				7.10	3.65			

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
FEBRUARY 2003

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	DRY	DRY	DRY	7.15	3.70	DRY	DRY	
2				7.15	3.70			
3				7.20	3.65			
4				7.15	3.60			
5				7.10	3.55			
6				7.10	3.55			
7				6.90	3.50			
8				6.90	3.55			
9				6.90	3.50			
10				7.10	3.50			
11				7.00	3.40			
12				7.00	3.35			
13				6.80	3.20			
14				6.80	3.20			
15				6.80	3.30			
16				6.80	3.25			
17				6.90	3.40			
18				6.90	3.35			
19				6.90	3.35			
20				6.90	3.30			
21				6.95	3.35			
22				6.95	3.40			
23				7.10	3.45			
24				7.05	3.45			
25				7.10	3.40			
26				7.10	3.45			
27				7.10	3.45			
28				6.95	3.45			

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
MARCH 2003

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	DRY	DRY	DRY	7.15	3.55	DRY		
2				7.20	3.55			
3				7.40	3.50			
4				7.15	3.40			
5				7.10	3.30			
6				7.10	3.25			
7				7.10	3.15			
8				7.10	3.10			
9				7.10	3.10			
10				7.10 closed	3.05 closed		Opened	
11				7.70	3.60		4.00	
12				DRY	6.00		3.80	
13					dry		3.60	
14							3.30	
15							3.10	
16							3.10	
17							2.95	
18							2.75	
19							2.55	
20							2.40	
21							2.20	
22							2.05	
23							1.90	
24							1.75	
25							1.60	
26							1.45	
27							1.35	
28							1.25	
29							1.15	
30							1.10	
31							1.10	

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
APRIL 2003

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	DRY	DRY	DRY	DRY	DRY	DRY	1.00	
2							0.90	
3							0.85	
4							0.75	
5							0.70	
6							0.60	
7							0.55	
8							0.45	
9							0.40	
10							0.30	
11							0.25	
12							0.20	
13							0.15	
14			OPENED				0	CLOSED
15			7.00+				0.55	
16			7.00+				1.10	
17			6.75				1.60	
18			6.20				2.05	
19			6.00				2.50	
20			5.65				3.00	
21			5.40				3.30	
22			5.00				3.65	
23			4.80				4.20	
24			4.50				DRY	
25			4.30				OPENED	
26			4.40					
27			4.45					
28			4.50				4.25	
29			4.45				4.25	
30			4.45				4.25	
31								

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
MAY 2003

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	DRY	DRY	4.45	DRY	DRY	DRY	4.25	
2			4.45				4.20	
3			4.45				4.20	
4			4.50				4.25	
5			4.50				4.25	
6			4.50				4.25	
7			4.50				4.25	
8			4.50				4.25	
9			4.40				4.20	
10			4.30				4.20	
11			4.20				4.20	
12			4.20				4.10	
13			4.20				3.95	
14			4.20				3.85	
15			4.20				3.70	
16			3.60				4.20	
17			3.50				4.20	
18			3.50				4.20	
19			3.40				4.20	
20			3.35				4.20	
21			3.25				4.20	
22			3.10				4.20	
23			3.00				4.20	Shut #7
24			2.60				DRY	
25			2.15					
26			1.75					
27			1.20					
28			0.70					
29			0.15	Opened				
30			0					
31			0.80					

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
JUNE 2003

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	DRY	DRY	1.45	2.80	DRY	DRY	DRY	
2			1.80	Full To Pipe				4 to Pond 5
3			1.70	Overflow				
4			1.40	To Pond 5				
5			1.10					
6			0.80					
7			0.60					
8			0.35					
9			0.15					
10			0					
11			0.45					
12			0.85		8.80			
13			1.20		7.80			
14			1.40		7.05			
15			1.85		6.40			
16			2.05		5.90			
17			1.70		6.20			
18			1.35		6.95			
19			1.00		7.60			
20			0.40		8.10			
21			0.50		8.40			
22			0.30		8.50			
23			0.10		8.50			
24			0		8.50			
25			0		8.00			
26			0		7.30			
27			0.10		6.60			
28			0.20		6.00			
29			0.30		5.45			
30			0.40	Full to Pipe	4.90			Pond 4 to 5
31								

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
July 2003

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	DRY	DRY	0.30	AT PIPE	4.00	DRY	DRY	
2			0.15	OVERFLOW	4.50			
3			0		4.60			
4			0		4.30			
5			0.10		3.75			
6			0.55		3.30			
7			0.70		3.05			
8								
9			0.90		2.70			
10			0.70		2.70			
11			0.40		3.10			
12			0.15		3.45			
13			0.35		3.40			
14			0.30		3.30			
15			0.25		3.35			
16			0.15		3.15			
17			0.1 CLOSED		2.65			
18			0.25	CLOSED	2.40			
19			0.65		3.00			
20			1.00		3.85			
21			1.30		4.60			
22			1.60	0.10	5.30			
23			2.00	0.30	6.00			
24			2.30	0.50	6.65			
25			2.50	0.80	7.20			
26			2.90	1.20	7.70			
27			3.30	1.50	8.15			
28			3.35	2.05	8.55			
29			3.50	3.85	8.95			
30			3.80	4.10	9.35			
31			4.05	4.40	9.70 OPEN			

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
August 2003

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	DRY	DRY	4.25	4.60	9.05	DRY	0.45	
2			4.50	3.50	8.50		0.50	
3			4.75	3.70	8.00		0.55	
4			5.00	4.00	7.60		0.60	
5			5:15	4.15	7.20		0.60	
6			5.35	4.35	6.90		0.60	
7			5.55	4.55	6.55		0.65	
8			5.75	6.05	6.30		0.65	
9			5.95	6.50	6.05		0.65	
10			6.10	6.65	5.85		0.65	
11			6.30	6.85	5.70		0.65	
12			6.50	7.05	5.50		0.60	
13			6.65	7.25	5.45		0.60	
14			6.85	7.45	5.30		0.60	
15			7.00	7.60	5.25		0.55	
16			7.20	7.80	5.10		0.55	
17			7.30	8.00	5.00		0.55	
18			7.50	8.15	4.90		0.55	
19			7.50	8.15	4.75		0.50	
20			DRY	DRY	4.60		0.40	
21					4.50		0.40	
22					4.40		0.35	
23					4.25		0.35	
24					4.15		0.35	
25					4.00		0.35	
26					3.80		0.30	
27					3.65		0.30	
28					3.50		0.30	
29					3.35		0.35	
30					3.20		0.35	
31					3.10		0.40	

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
September 2003

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	DRY	DRY	DRY	DRY	3.00	DRY	0.40	
2					2.90		0.40	
3					2.75		0.40	
4					2.60		0.40	
5					2.50		0.40	
6					2.45		0.40	
7					2.40		0.40	Pond 5 to 4
8					2.40		0.40	
9					2.35		0.40	
10					2.30		0.0	
11					2.30		0.40	
12					2.30		0.40	
13					2.30		0.35	
14					2.25		0.35	
15					2.25		0.35	
16					2.20		0.35	
17				8.00	2.20		0.30	
18				7.90	2.20		0.30	
19				7.80	2.20		0.30	
20				7.70	2.20		0.30	
21				7.60	2.20		0.30	
22				7.45	2.20		0.30	
23				7.30	2.20		0.30	
24				7.20	2.20		0.15	
25				7.00	2.20		0.10	
26				6.95	2.20		0.05	
27				6.60	2.05		0.15	
28				6.10	2.00		0.15	
29				5.65	2.00		0.10	
30				5.25	2.00		0.10	

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
OCTOBER 2003

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	DRY	DRY	DRY	4.90	2.00	DRY	0.10	
2				4.60	2.00		0.10	
3				4.30	2.00		0.10	
4				4.00	2.00		0.10	
5				3.70	2.00		0.05	
6				3.45	2.00		0.05	
7				3.20	2.00		0.05	
8				2.90	2.00		0.05	
9				2.65	2.00		0	
10				2.40	2.00		0	
11				2.20	2.00		0	
12				1.90	2.00		000.10	
13				1.60	2.00		0.10	
14				2.00	2.00		0.10	
15				2.00	2.00		0.15	
16				1.85	1.85		0.10	
17				1.80	1.80		0.40	
18				1.60	1.60		0.60	
19				1.30	1.30		0.30	
20			OPENED	1.10	1.10		0.90	Close 5,7,4
21			7.00+	1.55	1.55		0.75	
22			6.90	2.00	2.00		1.00	
23			6.40	2.45	2.45		1.25	
24			5.90	2.85	2.85		1.55	
25			5.55	3.25	3.25		1.70	
26			5.20	2.00	3.60		2.00	
27			4.90	2.35	3.80		2.20	
28			4.60	2.75	4.00		2.35	
29			4.30	3.10	4.30		2.55	
30			4.15	3.50	4.50		2.70	
31			4.00	3.80	4.70		2.70	

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
NOVEMBER 2003

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	DRY	DRY	4.00	4.10	5.30	DRY	2.90	
2			3.90	4.40	5.60		3.10	
3			3.75	4.65	5.85		3.20	
4			3.60	4.90	6.00		3.30	
5			3.55	5.15	6.25		3.45	
6			3.50	5.40	6.45		3.60	
7			3.50	5.60	6.60		3.60	
8			3.35	5.85	6.95		3.85	
9			3.20	5.90	6.95		3.95	
10			3.10	6.20	7.10		4.00	
11			3.00	6.40	7.30		DRY	
12			2.80	6.60	7.40			
13			2.65	6.75	7.50			
14			2.50	6.95	7.70			
15			2.30	7.10	7.85			
16			2.10	7.20	8.00			
17			2.00	7.40	8.10			
18			1.70	7.70	8.25			
19			1.50	7.70	8.35			
20			1.30	7.85	8.50			
21			1.10	8.00	8.60			
22			1.00	DRY	8.70			
23			0.20		8.80			
24			0.50		8.90			
25			0.25		9.00			
26		OPEN	0.10		9.00			closed #3
27		6.45	0.80		9.20			
28		6.00	1.50		9.25			
29		5.65	2.20		9.35			
30		5.25	2.80		9.45			
31								

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
December 2003

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	DRY	4.90	3.40	DRY	9.50	DRY	DRY	
2		4.60	3.90		9.60			
3		4.30	4.40		9.65			
4		4.00	4.85		9.70			
5		3.80	5.25		9.80			
6		3.55	5.65		9.85			
7		3.35	6.00		9.90			
8		3.20	6.35		10.00			
9		3.00	6.65		10.00			
10		2.80	7.00		10.10			
11		2.55	7.30		10.15			
12		2.40	7.60		10.20			
13		2.30	DRY		10.20			
14		2.10			10.30			
15		1.90			10.30			
16		1.80			10.30			
17		1.70			10.35			
18		1.55			10.40			
19		1.45			10.45			
20		1.30			10.45			
21		1.30			10.55			
22		1.30			10.55			
23		1.20			10.60			
24		1.15			10.60			
25		1.00			DRY			
26		0.90						
27		0.90						
28		0.85						
29		0.80						
30		0.70						
31		0.60						

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
JANUARY 2004

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	DRY	0.50	DRY	DRY	DRY	DRY	DRY	
2		0.30						
3		0.20						
4		0.20						
5	OPENED	0.05						
6	5.90	0.20			→POND 2			
7	5.85	0.25			10.45			
8	5.75	0.25			10.55			
9	5.65	0.30			10.65			
10	5.50	0.40			DRY			
11	5.30	0.45						
12	5.20	0.50						
13	5.00	0.55						
14	4.95	0.55						
15	4.85	0.55						
16	4.75	0.55						
17	4.65	0.55						
18	4.60	0.60						
19	4.60	0.70						
20	4.50	0.60						
21	4.40	0.60						
22	4.40	0.60						
23	4.30	0.65						
24	4.20	0.70						
25	4.20	0.70						
26	4.15	0.70						
27	4.10	0.65						
28	4.05	0.65						
29	4.05	0.65						
30	4.05	0.65						
31	4.05	0.65						

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
FEBRUARY 2004

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	4.05	0.75	DRY	DRY	DRY	DRY	DRY	
2	4.05	0.80						
3	4.00	0.65						
4	4.00	0.65						
5	4.00	0.65						
6	4.00	0.70						
7	4.05	0.70						
8	4.05	0.70						
9	4.10	0.80						
10	4.10	0.80						
11	4.10	0.70						
12	4.10	0.65						
13	4.10	0.60						
14	4.10	0.65						
15	4.20	0.70						
16	4.20	0.70						
17	4.30	0.60						
18	4.30	0.50						
19	4.30	0.45						
20	4.35	0.40						
21	4.35	0.35						
22	4.35	0.30						
23	4.30	0.20						
24	4.15	0.15						
25	4.00	0.20			OPENED			
26	3.80	0.30			9.75			
27	3.75	0.65			9.05			
28	3.75	0.90			8.45			
29	3.75	1.20			7.95			

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
MARCH 2004

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	3.75	1.40	DRY	DRY	7.50	DRY	DRY	
2	3.70	1.40			7.00			
3	3.70	1.60			6.60			
4	3.75	1.70			6.20			
5	3.80	1.90			5.85			
6	3.80	2.00			5.45			
7	3.85	2.15			5.15			
8	3.95	2.25			4.85			
9	4.00	2.30			4.55			
10	4.05	2.40			4.25			
11	4.10	2.40			4.00			
12	4.15	2.50			3.80			
13	4.20	2.60			3.55			
14	4.20	2.55			3.35			
15	4.25	2.70			3.20			
16	4.30	2.70			3.00			
17	4.30	2.75			2.85			
18	4.35	2.75			2.70			
19	4.40	2.80			2.60			
20	4.40	2.80			2.45			
21	4.50	2.80			2.40			#5→#4
22	4.50	2.80			2.40			
23	3.95	2.95			2.40			
24	3.50	3.15			2.40			
25	3.20	3.20			2.40			
26	2.90	3.25			2.40			
27	2.75	3.35			2.40			
28	2.65	3.35			2.40			
29	2.60	3.30			2.40			
30	2.55	3.25			2.40			
31	2.55	3.25			2.40			

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
APRIL 2004

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	2.55	3.25	DRY	DRY	2.40	DRY	DRY	5 TO 4
2	2.50	3.25			2.40			
3	2.50	3.25			2.40			
4	2.50	3.20			2.45			
5	2.50	3.20			2.40			
6	2.50	3.20			2.40			
7	2.50	3.20			2.40			
8	2.50	3.20			2.40			
9	2.50	3.20			2.40			
10	2.50	3.20			2.40			
11	2.50	3.20			2.40			
12	2.50	3.20			2.40			
13	2.45	3.15			2.40			
14	2.45	3.15			2.40			
15	2.45	3.15	OPEN		2.40			2OFF,3ON
16	2.05	3.50			2.30			
17	1.75	4.00			2.35			
18	1.55	4.45			2.30			
19	1.35	4.85			2.30			
20	1.20	5.20			2.30			
21	1.50	5.50		6.55	2.20			
22	2.15	5.85		6.35	2.25			
23	2.65	6.05		6.30	2.30			
24	3.20	6.35		6.30	2.35			
25	3.60	6.60		6.25	2.30			
26	3.95	6.60		6.25	2.30			
27	4.25	DRY		6.25	2.30			
28	4.60			6.25	2.35			
29	4.85			6.30	2.35			
30	5.10			6.40	2.30			
31								

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
MAY 2004

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	5.30	DRY	DRY	6.40	2.35	DRY	DRY	
2	5.50			6.45	2.35			
3	5.70			6.50	2.25			
4	6.00			6.55	2.35			
5	DRY			6.55	2.35			
6				6.60	2.35			
7				6.60	2.35			
8				8.60*	2.40			
9				8.60	2.40			
10				8.60	2.35			
11			9.70	8.60	2.40			
12			9.70	8.60	3.10			
13			9.40	8.60	3.60			#5 Closed
14			9.20	DRY	4.00			
15			9.10		4.40			
16			9.00		4.70			
17			8.90		5.10			
18			8.80		5.35			
19			8.75		5.60			
20			8.70		5.90			
21			8.65		6.15			
22			8.60		6.40			
23			8.60		6.50			
24			8.55		6.80			
25			8.50		7.00			
26			8.50		7.20			
27			8.45		7.40			
28			8.50		7.55			
29			8.50		7.75			
30			8.50		7.85			
31			8.50		8.00			

Measurements in feet. *Added 2 ft. to measurement due to short pole.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
JUNE 2004

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	DRY	DRY	8.45	DRY	8.15	DRY	DRY	
2			8.40		8.30			
3			8.45		8.35			
4			8.55		8.55			
5			8.20		8.70			
6			8.15		8.80			
7			8.10		8.90			
8			8.00		9.05			
9			7.90		9.15			
10			7.80		9.20			
11			7.70		9.30			
12			7.65		9.40			
13			7.55		9.50			
14			7.50		9.60			
15			7.40		9.70			
16			7.25		9.80			
17			7.20		10.00			
18			7.10		10.00			
19			7.00		10.00			
20			6.95		10.20			
21			6.85		10.30			
22			6.75		10.40			
23			6.60		10.45			
24			6.50		10.55			
25			6.40		DRY			
26			6.35					
27			6.25					
28			6.25					
29			6.00					
30			5.85					

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
JULY 2004

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	DRY	DRY	5.75	DRY	DRY	DRY	DRY	
2			5.60					
3			5.50					
4			5.40					
5			5.30					
6			5.15					
7			5.00					
8			4.90					
9			4.80					
10			4.75					
11			4.45					
12			4.60					
13			4.45					
14			4.40					
15			4.35					
16			4.30					
17			4.25					
18			4.25					
19			4.25					
20			4.15					
21			4.10					
22		OPEN	4.00					
23		8.20	4.95					
24		7.50	5.90					
25		6.85	6.80					
26		6.30	7.60					
27		5.80	8.30					
28		5.40	9.00					
29		5.10	9.50					
30		4.80	DRY					
31		4.60						

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
AUGUST 2004

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	DRY	4.45	DRY	DRY	DRY	DRY	DRY	
2		4.30						
3		4.10						
4		4.00						
5		3.95						
6		3.90						
7		3.85						
8		3.75						
9		3.70						
10		3.60						
11		3.55						
12		3.40						
13		3.25						
14		3.15						
15		3.05						
16		2.90						
17		2.80						
18		2.70						
19		2.60						
20		2.50						
21		2.40						
22		2.30						
23	OPEN	2.20						
24	6.60	2.75						
25	5.25	3.20						
26	4.25	3.55						
27	3.65	3.70						
28	3.40	3.80						
29	3.25	3.75						
30	3.20	3.75						
31	3.40	3.50						

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
SEPTEMBER 2004

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	3.60	3.30	DRY	DRY	DRY	DRY	DRY	
2	3.75	3.15						
3	3.85	3.00						
4	3.90	2.90						
5	3.90	2.80						
6	3.90	2.70						
7	3.85	2.55						
8	3.80	2.40						
9	2.95	2.65						
10	2.45	2.75					OPEN	
11	2.55	2.95						
12	2.65	3.10						
13	2.75	3.20						1,2 SHUT
14	3.40	3.75						
15	4.00	4.25					6.15	
16	4.50	4.75					6.00	
17	5.00	5.10					5.85	
18	5.40	5.60					5.75	
19	5.80	6.05					5.70	
20	6.10	6.40					5.55	
21	6.40	6.75					5.45	
22	6.70	7.10					5.30	
23	7.00	7.35					5.20	
24	7.20	7.65					5.10	
25	7.45	8.00					5.00	
26	7.70	8.20					4.95	
27	DRY	8.50					4.85	
28		DRY					4.75	
29							4.70	
30							4.60	
31								

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
OCTOBER 2004

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	DRY	DRY	DRY	DRY	DRY	DRY	4.55	
2							4.55	
3							4.50	
4							4.45	
5							4.40	
6							4.35	
7							4.30	
8							4.35	
9							4.40	
10							4.40	
11							4.40	
12							4.40	
13							4.45	
14							4.40	
15							4.50	
16							4.50	
17							4.55	
18							4.55	
19							4.50	
20							4.40	
21							4.35	
22							4.30	
23							4.35	
24							4.40	
25							4.40	
26							4.40	
27							4.30	
28							4.30	
29							4.30	
30							4.35	
31							4.40	

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
NOVEMBER 2004

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	DRY	DRY	DRY	DRY	DRY	DRY	4.40	
2							4.40	
3							4.40	
4							4.40	
5							4.45	
6							4.40	
7							4.45	
8							4.45	
9							4.40	
10							4.40	
11							4.40	
12							4.40	
13							4.40	
14							4.40	
15							4.45	
16							4.40	
17							4.40	
18							4.40	
19							4.40	
20							4.40	
21							4.40	
22							4.35	
23							4.35	
24							4.35	
25							4.35	
26							4.35	
27							4.40	
28							4.40	
29							4.40	
30							4.35	

Measurements in feet.

CITY OF REEDLEY
Wastewater Treatment Plant
Pond Freeboard Readings
DECEMBER 2004

DATE	POND 1	POND 2	POND 3	POND 4	POND 5	POND 6	POND 7	Comments
1	DRY	DRY	DRY	DRY	DRY	DRY	4.35	
2							4.35	
3							4.35	
4							4.35	
5							4.30	
6							4.30	
7							4.25	
8							4.15	
9							4.15	
10							4.15	
11							4.15	
12							4.20	
13							4.20	
14							4.20	
15							4.20	
16							4.25	
17							4.25	
18							4.30	
19							4.30	
20							4.35	
21							4.30	
22							4.30	
23							4.25	
24							4.25	
25							4.25	
26							4.25	
27							4.25	
28							4.15	
29							4.05	
30							4.00	
31							3.70	

Measurements in feet.

APPENDIX G - WATER BALANCES

Table G.1 **Estimation of Evaporation Rate From Surface of Ponds**
Wastewater Treatment Plant Master Plan
City of Reedley

	Average Rainfall inches (A)	100 YR Precip in/month (B)	Pan Evap inches (C)	Lake Evap inches (D)	Net Gain/Loss inches (E)
October	0.7	1.15	4.40	3.87	-2.72
November	0.7	1.15	2.10	1.85	-0.69
December	2.7	4.45	1.00	0.88	3.57
January	2.4	3.96	1.30	1.14	2.82
February	3	4.95	2.30	2.02	2.92
March	1.9	3.13	4.20	3.70	-0.56
April	1.3	2.14	5.90	5.19	-3.05
May	0.2	0.33	8.30	7.30	-6.97
June	0	0.00	9.60	8.45	-8.45
July	0	0.00	10.00	8.80	-8.80
August	0	0.00	8.50	7.48	-7.48
September	0	0.00	6.3	5.54	-5.54
Total	12.90	21.28	63.90	56.23	-34.95

(A) Based on Dinuba's average monthly rainfall data (www.worldclimate.com).
(B) Based on Visalia's 100 year rain event and Dinuba's monthly rainfall distribution.
(C) Ep = pan evaporation rates, based on San Joaquin Valley Class A pan evaporation rates.
(D) = (C)*0.8*1.10.
Source= California Department of Water Resources, "Vegetative Water use in California", April 1975, Bulletin 113-3, Table 1, pg 9. Cp = pan coefficient to correct for excess evaporation from a pan as compared to a large body of water. K = weather correction reflecting that in wetter years, evaporation is less. K = 1.10 for dry conditions.
(E) = (B) - (D)

Table G.2 Water Balance for 4.69 MGD WWTF Effluent Flow
Wastewater Treatment Plant Master Plan
City of Reedley

Month	Wastewater Flow		Effluent Ponds				
			Precipation Gains	Evaporation Losses	Percolation Losses	Net Water Available in Ponds	Culmulative Water Remaining in Ponds
	(mg) (A)	(ac-ft) (B)	(ac-ft) (C)	(ac-ft) (D)	(ac-ft) (E)	(ac-ft) (F)	(ac-ft) (G)
October	145.5	446.5	3.45	9.93	439.7	0.3	0.3
November	140.8	432.1	3.45	4.74	425.6	5.2	5.5
December	145.5	446.5	13.31	2.26	439.7	17.8	23.3
January	145.5	446.5	11.83	2.93	439.7	15.7	39.0
February	131.4	403.3	14.79	5.19	397.2	15.7	54.7
March	145.5	446.5	9.37	9.47	439.7	6.6	61.3
April	140.8	432.1	6.41	13.31	425.6	-0.4	61.0
May	145.5	446.5	0.99	18.72	439.7	-11.0	50.0
June	140.8	432.1	0.00	21.66	425.6	-15.1	34.9
July	145.5	446.5	0.00	22.56	439.7	-15.8	19.1
August	145.5	446.5	0.00	19.17	439.7	-12.4	6.6
September	140.8	432.1	0.00	14.21	425.6	-7.7	0.0
Total	1,572.16	4,824.94	63.61	129.93	4,751.98	6.65	max 61.34

(A) Based on a wastewater flow of: **4.693 mgd**
(B) = (A)*3.069
(C) Based on Table G.1 (B); Total acres of pond area = 35.87
(D) Pond surface area (acre) with 2 ft freeboard: 30.76
(E) Based on 0.5 ft/day percolation rate (WDR 5-01-257, Page 9, #41) and pond bottom area (acre) of: 28.37
(F) = (B)+(C) -(D) - (E)
(G) = previous months cumulative effluent remaining in ponds + current months remaining effluent.

Notes:
Total Storage Volume available = Ponds 2-5, 7, and half Pond 1 150 acre-feet

Table G.3	Water Balance for 6.88 MGD WWTF Effluent Flow Wastewater Treatment Plant Master Plan City of Reedley							
			Effluent Ponds					
Month	Wastewater Flow		Precipation Gains	Evaporation Losses	Percolation Losses	Net Water Available in Ponds	Culmulative Water Remaining in Ponds	
	(mg) (A)	(ac-ft) (B)	(ac-ft) (C)	(ac-ft) (D)	(ac-ft) (E)	(ac-ft) (F)	(ac-ft) (G)	
October	213.3	654.6	4.91	14.59	644.3	0.6	0.6	
November	206.4	633.4	4.91	6.96	623.5	7.9	8.5	
December	213.3	654.6	18.94	3.32	644.3	25.9	34.4	
January	213.3	654.6	16.84	4.31	644.3	22.8	57.2	
February	192.6	591.2	21.05	7.63	581.9	22.7	79.9	
March	213.3	654.6	13.33	13.93	644.3	9.7	89.5	
April	206.4	633.4	9.12	19.57	623.5	-0.5	89.0	
May	213.3	654.6	1.40	27.53	644.3	-15.9	73.2	
June	206.4	633.4	0.00	31.84	623.5	-21.9	51.3	
July	213.3	654.6	0.00	33.17	644.3	-22.9	28.4	
August	213.3	654.6	0.00	28.19	644.3	-17.9	10.5	
September	206.4	633.4	0.00	20.89	623.5	-11.0	0.0	
Total	2,304.80	7,073.43	90.51	191.04	6,962.45	10.46	max 89.54	

(A) Based on a wastewater flow of: **6.88 mgd**

(B) = (A)*3.069

(C) Based on current pond area of 35.87 acres + additional pond (footnote 1): 51.04

(D) Based on current pond surface area of 30.76 acres + additional pond surface area (footnote 2): 45.23

(E) Based on 0.5 ft/day percolation rate (WDR 5-01-257, Page 9, #41) and pond bottom area of 28.37 acres + additional pond bottom area (footnote 3): 41.57

(F) = (B)+(D) -(E) - (F)

(G) = previous months cumulative effluent remaining in ponds + current months remaining effluent.

Notes:

Additional pond is assumed to have a 3:1 slope with a maximum water depth of 5' and a 2' freeboard.

1. Additional pond acreage needed to meet disposal capacity of 6.88 mgd (51.04-35.87): 15.17 acres
2. Additional surface areage needed to meet disposal capacity of 6.88 mgd (15.17 x 0.9536): 14.47 acres
3. Additional pond bottom acreage needed to meet disposal capacity of 6.88 mgd = (15.17 ac * 43,560 sf *0.7830) *0.000023 + (((15.17 ac * 43,560 sf *0.7830) - (15.17 ac *43,560 sf *0.9536))/2) *0.000023 = 13.20 acres
4. Total Storage Volume available = Existing Ponds 1-7 (150 AC-FT) + Future Pond (66 AC-FT) = [(15.17 ac * 43,560 sf *0.7830 * 5 feet) *0.000023 + ((((15.17 ac * 43,560 sf *0.7830) - (15.17 ac *43,560 sf *0.9536))/2) *5) *0.000023] + 150 acres = 216 acre-feet

APPENDIX H - 1993 POTENTIAL WATER RECLAMATION AREA

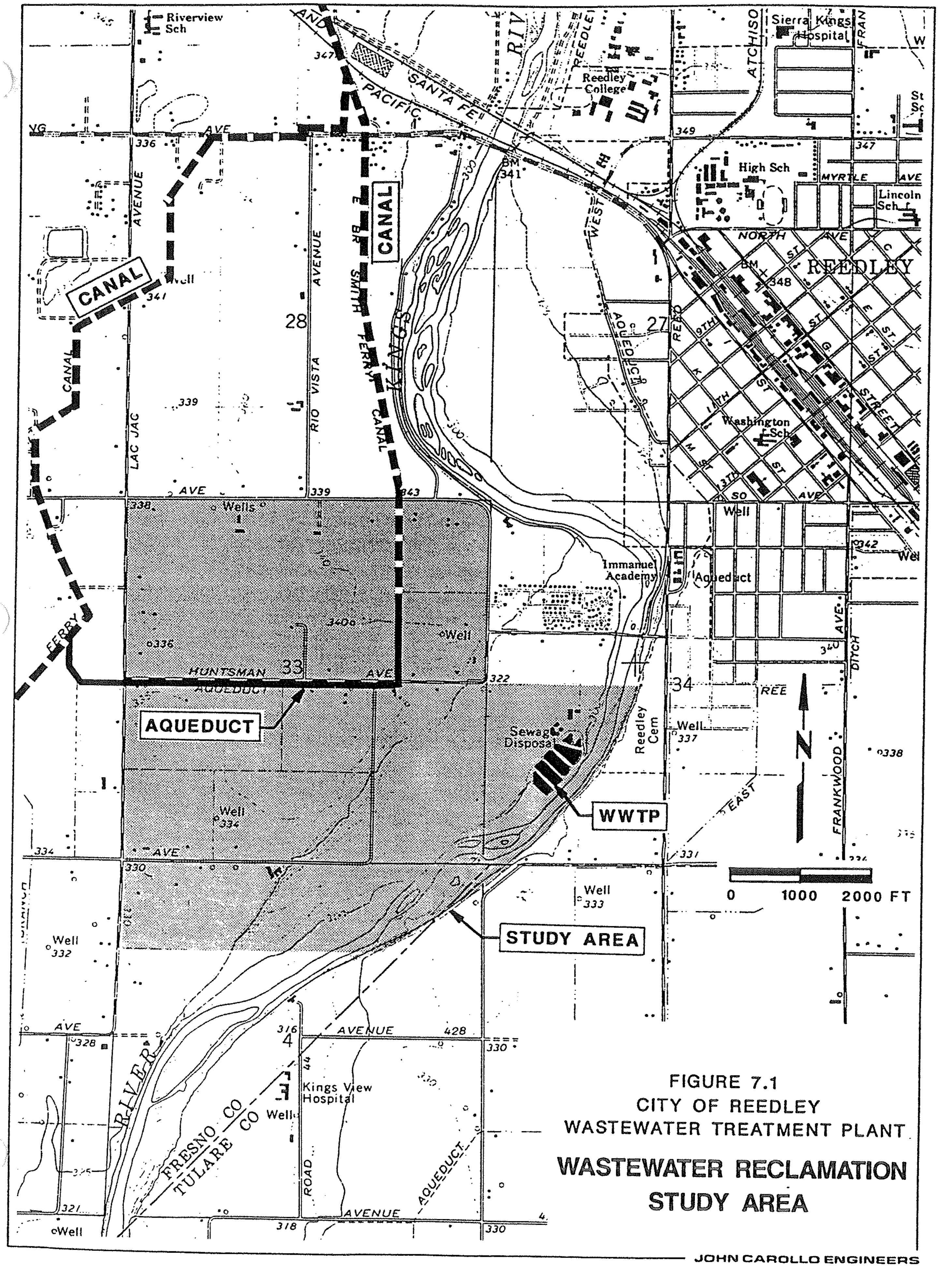

FIGURE 7.1
CITY OF REEDLEY
WASTEWATER TREATMENT PLANT

WASTEWATER RECLAMATION STUDY AREA

JOHN CAROLLO ENGINEERS

APPENDIX I - 1997 SUMMARY OF RECLAMATION ALTERNATIVES

City

Wastewater I

Summary c

Description	Goals	Advantages
ALTERNATIVE #1 **Direct Farm Irrigation** • Construct wastewater distribution system for irrigation of privately owned farmland. • 600 acres of stone fruit and vineyard. Irrigated with 50% wastewater/50% fresh water. • **1-1/2 miles of 18" pipeline and pump station.** • Disinfected Secondary Reclaimed Water • In CID service area.	• **Dispose of 1,534 ac-ft/year.** • Disposal of 72% of 1996 effluent. • Crop uptake of nutrients. • Provide an alternative irrigation water supply.	• Reclaimed Wastewater pro an alternative water supply. • Nutrient value of water. • Takes wastewater offsite fo beneficial reuse.
ALTERNATIVE #2 **Consolidated Irrigation District - Smith-Ferry Canal** • Construct wastewater conveyance system for connection to CID's Smith-Ferry Canal. • Advanced treatment filtration and coagulation. • Mixing of fresh water with wastewater at a 20:1 ratio. • **3/4 mile 30" pipeline and pump station.** • Tertiary Reclaimed Water. • Oxidation, coagulation, clarification, filtration and disinfection.	• **Dispose of 885 ac-ft/year.** • Disposal of 41% of 1996 effluent. • Crop uptake of nutrients. • Provide an alternative irrigation water supply.	• Delivers wastewater to variou fields served by the canal. • Reclaimed Wastewater provi an alternative water supply. • Nutrient value of water. • Takes wastewater offsite for beneficial reuse.
ALTERNATIVE #3 **Landscape & Golf Course Irrigation** • Construct wastewater distribution system for irrigation of public landscape areas. (120 acres). • Kings River Community College grounds. • Proposed green belt parkway through City. • Selma Golf Course. • Oxidation, coagulation, clarification, filtration and disinfection. • Disinfected Tertiary Reclaimed Water.	• **Dispose of 461 ac-ft/year.** • Disposal of 22% of 1996 effluent. • Stabilize groundwater supplies.	• Reclaimed Wastewater provid an alternative water supply. • Nutrient value of water. • Takes wastewater offsite for beneficial reuse.
ALTERNATIVE #4 **UC Kearney Ag Field Station** • Construct wastewater conveyance system for connection to Kearney irrigation systems. • 300 acres of stone fruit, vineyard, and row crops. • **No current interest as a reclaimed wastewater user.**	• **Dispose of unknown ac-ft/year.** • Crop uptake of nutrients. • Research wastewater irrigation.	• High degree of technical expert • Nutrient value of water. • Takes wastewater offsite for beneficial reuse.
ALTERNATIVE #5 **Irrigation of City Owned Farmland** • Wastewater irrigation of City owned orchard. • 23 acres of orchard. • Option to convert to less restrictive crops/grass. • Potential City owned golf driving range. • Disinfected Secondary Reclaimed Water	• **Dispose of 59 to 167 ac-ft/year.** • Disposal of 3% to 8% of 1996 effluent. • Crop uptake of nutrients. • Can demonstrate utilization of reclaimed water to local growers.	• Reclaimed Wastewater provides an alternative water supply. • Nutrient value of water. • Potential income source.

APPENDIX J - IRRIGATION SCHEDULE FOR ALFALFA

Table J.1	**Irrigation Schedule for Alfalfa Wastewater Treatment Plant Master Plan City of Reedley**	
Month	**Irrigation demand[1] (acre-inches)**	**Nitrogen Loading due Wastewater Application[2] (lbs)**
October	3.02	7
November	1.69	4
December	0.90	2
January	0.89	2
February	1.60	4
March	3.49	8
April	4.21	10
May	5.59	13
June	8.47	19
July	6.89	16
August	5.99	14
September	5.78	13
Total	48.52	110
Nitrogen Uptake Required for Crop[3]		480
Application Rate (acre-feet/Year)		4.0

Note:
(1) Irrigation demand based UC Cooperative Extention Kern County Table 3 (See Attached Table).
(2) Nitrogen loading (lbs) = (acre-in/12) (ww N conc)(0.3258)(8.34)
Wastewater Nitrogen Concentration (mg/L) 10
(3) Obtained from the Western Fertilizer Handbook.

Table 3: **"Normal Year" Crop ET for the southern San Joaquin Valley.** ***(See References for source.)***

Week Ending	Normal Year Grass ETo	Afalfa (non-dormant)	[1]Almond (no cover)	[2]Almond (active cover flood)	Black-eyes (full season)	[3]Carrots (2/1 plant)	[3]Carrots (9/1 plant)	Citrus	Corn (grain)	Cotton	Grapes	Pist-achios	Potato (2/1 plant)	Small Grains	[3]Tomato (3/10 plant)
1/6	0.17	0.18		0.17			0.19	0.13						0.01	
1/13	0.19	0.21		0.19			0.20	0.14						0.07	
1/20	0.22	0.23		0.22			0.22	0.17						0.10	
1/27	0.26	0.27		0.26			0.23	0.20						0.13	
2/3	0.31	0.32		0.31		0.62	0.28	0.23						0.19	
2/10	0.36	0.36		0.36		0.72		0.27					0.15	0.26	
2/17	0.42	0.43		0.42		0.04		0.31					0.15	0.34	
2/24	0.48	0.49	0.10	0.48		0.06		0.35					0.20	0.44	
3/3	0.55	0.55	0.21	0.56		0.07		0.40					0.28	0.51	
3/10	0.62	0.62	0.34	0.64		0.11		0.44	0.09				0.35	0.65	1.24
3/17	0.70	0.69	0.40	0.73		0.19		0.49	0.13				0.42	0.77	1.40
3/24	0.79	0.78	0.47	0.83		0.28		0.55	0.16		0.10	0.06	0.60	0.87	0.16
3/31	0.86	0.85	0.55	0.93		0.47		0.60	0.20		0.12	0.09	0.84	1.00	0.22
4/7	0.94	0.93	0.62	1.02		0.77		0.66	0.33		0.15	0.19	1.05	1.10	0.28
4/14	1.04	1.01	0.70	1.14		1.03		0.73	0.42	0.10	0.23	0.31	1.19	1.18	0.36
4/21	1.12	1.09	0.81	1.25		1.20		0.78	0.52	0.13	0.45	0.45	1.30	1.26	0.50
4/28	1.21	1.18	0.90	1.35		1.29		0.85	0.61	0.15	0.61	0.61	1.47	1.35	0.61
5/5	1.30	1.27	1.00	1.50	0.12	1.39		0.91	0.85	0.21	0.75	0.78	1.61	1.43	0.85
5/12	1.40	1.36	1.13	1.63	0.20	1.55		0.98	1.05	0.28	0.88	0.98	1.61	1.45	1.12
5/19	1.48	1.44	1.24	1.75	0.42	1.67		1.04	1.33	0.37	1.00	1.33	1.61	1.40	1.48
5/26	1.56	1.52	1.34	1.86	0.67	1.76		1.07	1.56	0.47	1.11	1.56	1.40	1.27	1.72
6/2	1.63	1.59	1.42	1.94	0.94	1.72		1.10	1.87	0.68	1.22	1.79	1.33	1.08	1.87
6/9	1.70	1.66	1.50	2.05	1.47	1.79		1.13	1.96	0.99	1.34	1.96	0.98	0.86	2.02
6/16	1.76	1.71	1.60	2.12	1.87	1.79		1.14	2.09	1.31	1.43	2.06	0.77	0.70	2.09
6/23	1.79	1.75	1.68	2.16	2.02	1.76		1.16	2.15	1.61	1.48	2.09			2.09
6/30	1.81	1.76	1.72	2.18	2.06	1.61		1.18	2.17	1.88	1.49	2.15			1.99
7/7	1.81	1.76	1.74	2.18	2.08	1.63		1.18	2.15	2.15	1.49	2.15			1.88
7/14	1.79	1.75	1.72	2.18	2.08			1.16	2.06	2.17	1.48	2.13			1.79
7/21	1.76	1.71	1.69	2.14	2.06			1.14	1.85	2.13	1.45	2.09			1.58
7/28	1.72	1.67	1.65	1.89	2.02			1.12	1.50	2.08	1.42	2.05			1.03
8/4	1.65	1.60	1.58	1.49	1.98			1.07	1.24	2.00	1.36	1.96			
8/11	1.58	1.54	1.52	1.11	1.90			1.03	1.03	1.91	1.30	1.88			
8/18	1.50	1.46	1.44	0.90	1.82			0.98	0.75	1.82	1.20	1.79			
8/25	1.43	1.39	1.37	1.36	1.65			0.93		1.73	1.09	1.60			
9/1	1.36	1.32	1.30	1.36	1.50		2.72	0.93		1.58	0.90	1.52			
9/8	1.28	1.25	1.21	1.41	1.36		2.56	0.93		1.38	0.78	1.28			
9/15	1.19	1.16	1.10	1.31	1.15		0.18	0.93		1.14	0.62	1.13			
9/22	1.09	1.07	0.99	1.24	0.83		0.33	0.71		0.90	0.49	1.05			
9/29	0.99	0.98	0.86	1.11	0.44		0.50	0.66		0.69	0.37	0.87			
10/6	0.90	0.89	0.76	0.98			0.63	0.62		0.51	0.23	0.78			
10/13	0.80	0.80	0.63	0.87			0.72	0.56		0.36	0.20	0.64			
10/20	0.70	0.71	0.55	0.74			0.70	0.49			0.18	0.52			
10/27	0.62	0.62	0.46	0.66			0.65	0.43			0.16	0.44			
11/3	0.53	0.54	0.37	0.55			0.58	0.37			0.13	0.37			
11/10	0.44	0.46	0.28	0.46			0.51	0.31			0.11	0.20			
11/17	0.36	0.38	0.22	0.37			0.41	0.25			0.09	0.14			
11/24	0.30	0.31	0.16	0.30			0.35	0.21			0.08	0.09			
12/1	0.23	0.24		0.23			0.26	0.16							
12/8	0.18	0.19		0.18			0.21	0.13							
12/15	0.15	0.16		0.15			0.18	0.11						0.04	
12/22	0.13	0.14		0.13			0.15	0.09						0.04	
12/29	0.15	0.17		0.13			0.17	0.11						0.05	
Total	**49.31**	**48.52**	**39.32**	**53.47**	**30.63**	**23.51**	**12.93**	**33.59**	**28.04**	**30.76**	**27.48**	**41.09**	**17.32**	**18.55**	**26.30**

[1] No winter weeds present.

[2] Winter and summer grasses actively growing and receiving irrigation water. If chemical mowing/killing used mid season, switch to No Cover schedule IF THE PROFILE IS FULL AT TIME OF TREATMENT.

[3] High evaporative losses occur during germination due to shallow planted seed and frequent sprinkling.

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(Also unpublished data and personal experience collected by Blake Sanden, Irrigation & Agronomy Advisor, UCCE Kern County.)

APPENDIX K - MORRO BAY/CAYUCOS SANITARY DISTRICT BIOSOLIDS DEMONSTRATION PROJECT

WEF Residuals and Biosolids Management Conference 2006
Greater Cincinnati, Ohio – March 12 – 15, 2006

THE SMALL COMMUNITIES OF MORRO BAY – CAYUCOS, CALIFORNIA, BIOSOLIDS REUSE DEMONSTRATION PROGRAM, FULLY CONTAINED WITHIN THEIR CITY LIMITS TO DEMONSTRATE PUBLIC ACCEPTABILITY AND COST EFFECTIVENESS

Bruce Keogh
Morro Bay – Cayucos Wastewater Treatment Plant
Morro Bay, California

David L. Stringfield, P.E.
Carollo Engineers, P.C.
Fresno, California

THE PROBLEM

Since 1998, Morro Bay – Cayucos Sanitary District (MBCSD) has contracted with McCarthy Family Farms, Inc., to compost biosolids at their San Joaquin Composting Facility, in Kern County, California, a county neighboring San Luis Obispo County wherein MBSCD is located. The problem is that most counties in California have severely restricted the import of Class B biosolids and MBCSD see the day when their biosolids will have to be treated to Class A, Exceptional Quality (EQ) no mater where the biosolids is further treated. The question has been; "Why can we not take care of our biosolids locally?"

INTRODUCTION AND GOALS

Over the past two years, staff at MBCSD has been developing a beneficial reuse program for the biosolids generated at MBCSD, through a program of composting the biosolids. The goal of the composting program has been to develop and implement a cost effective technique for producing Exceptional Quality (EQ) compost that meets the metals standards, Class A pathogen reduction standards, and vector attraction reduction standards contained in 40CFR Part 503.13 (Table 3), 40 CFR Part 503.32, and 40 CFR Part 503.33, respectively. The resulting product is high quality compost that meets all the 40CFR Part 503 requirements for Exceptional Quality compost that can be beneficially reused in the local community. *The goal of the program is to make the EQ compost available to the public for use as a high quality soil amendment.*

The composting program utilizes windrow composting; an EPA recognized method for the Processes to Further Reduce Pathogens (PFRP, 40CFR Part 503 Appendix B). MBCSD has been windrow-composting biosolids produced at MBCSD with green waste generated in the local community. During 2004, approximately 180 yards of composted biosolids were produced at MBCSD.

THE DEMONSTRATION PROJECT

The composted biosolids produced at MBCSD consist of biosolids mixed with shredded green waste. The origin of the green waste is from local arborists and green waste generated by the City of Morro Bay. Plant staff maintains records of the volume, type, and generator of the green waste received at the plant. Due to space constraints at the plant, only one windrow (consisting of between 120 and 180 yards of material) is constructed and managed at any given time. The composting operation is performed in one of twelve sludge-drying beds at MBCSD. The sludge drying beds are constructed of concrete and each sludge drying bed has a capacity of 5200 square feet with an under drain and decant system that drains back through the treatment processes.

The windrow is constructed using both volume ratios and bulk densities of the biosolids and green waste. Following construction of the windrow, the windrow is managed following the PRFP where the temperature of the windrow is maintained at or above 55° C for at least fifteen days and the windrow has to be turned at least five times during that period. The windrow composting process is expected to take twelve to sixteen weeks to complete the composting process. Following application of compost tea to biologically control re-growth of pathogens, the compost is moved to a second sludge drying bed for curing. Once the lab results have been received and compliance with 40CFR Part 503 requirements for EQ quality compost have been documented, the compost is made available to the public for a high quality soil amendment.

SUMMARY

Effective July 1, 2004 the composting operation at MBCSD has been permitted with the California Integrated Waste Management Board Permitting and Enforcement Division (CIWMB), facility file number 40 – AA - 0036. The composting operation is inspected quarterly by CIWMB staff. Prior to July 1, 2004, the composting operation was permitted with the San Luis Obispo County Public Health Department, Division of Environmental Health. Many local residents have availed themselves of the compost since the demonstration program and have expressed pleasure with the product provided by MBCSD.

Staff at MBCSD is proud of their hard work in developing and implementing the biosolids composting project. We are excited about the future potential of this project in developing a beneficial reuse program for the biosolids generated at MBCSD. As part of their presentation, the authors will further develop the inter-county biosolids disposal issues and the details of the composting demonstration project. The presentation will also include a cost comparison of inter-county transport for processing versus in-City processing and disposal.