APPENDIX D

City of Hollister Long-Term Wastewater Management Program

Long-Term Wastewater Management Program for the DWTP and IWTP

Prepared for

City of Hollister

375 Fifth Street
Hollister, CA 95023

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HydroScience Engineers, Inc.

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Executive Summary

The City of Hollister (City) has developed a Long-Term Wastewater Management Program (LTWMP) for reliably treating and disposing of the City's domestic and industrial wastewater. The LTWMP presents the City's plan for wastewater treatment and effluent management of current and future wastewater flows. The LTWMP is consistent with the City's General Plan in projecting growth and associated wastewater flows.

Regional water resources management was identified as a priority in the development of the LTWMP. The evaluation of effluent management and recycled water strategies for the LTWMP was a joint coordination and planning effort by local agencies tasked with managing these resources. The City of Hollister, San Benito County (County), and the San Benito County Water District (SBCWD), collectively referenced as stakeholders, have developed a path for implementation of a LTWMP that is consistent with the responsible management of local water resources.

The stakeholders have identified the ultimate goal of the LTWMP to be to provide high quality wastewater effluent suitable for direct reuse on high value, quality sensitive crops. In order to accomplish this goal, the overall water quality in the region must be substantially improved. To this end, the stakeholders have formally agreed to accomplish this goal within a specified time line.

Wastewater Flows

Future wastewater flows were project based on projected population growth through the year 2023, which is the planning horizon for the City's General Plan. The LTWMP assumes that the City's new Domestic Wastewater Treatment Plant (DWTP) will treat wastewater from the Sunnyslope County Water District as well as from the City of Hollister in the future. Assumptions used in projecting wastewater flows are consistent with the City's General Plan and include:

- 2.6% annual increase in residential development.
- 2.9% annual increase in commercial development.
- 2.6% annual increase in school development.
- 2.67% weighted annual average increase in wastewater flow (General Plan Build-Out).
- 0.25 MGD (million gallons per day) initial flow at Ridgemark WWTP (Sunnyslope County Water District).
- 4.2% annual increase in wastewater flow from Sunnyslope County Water District (San Benito County Water District, Schaaf & Wheeler, 1999).

Based upon these assumptions and current DWTP flows, the following average dry weather flow (ADWF) projections were developed for the LTWMP:

Wastewater Flow Projections for the City of Hollister and Sunnyslope County Water District

Year	ADWF (MGD)			Year	ADWF (MGD)		
	Hollister[a]	SCWD[b]	Total		Hollister[a]	SCWD[b]	Total
2008	2.72	0.25	2.97	2016	3.36	0.35	3.71
2009	2.79	0.26	3.05	2017	3.45	0.36	3.81
2010	2.87	0.27	3.14	2018	3.54	0.38	3.92
2011	2.94	0.28	3.22	2019	3.63	0.39	4.02
2012	3.02	0.29	3.31	2020	3.73	0.41	4.14
2013	3.10	0.31	3.41	2021	3.83	0.43	4.26
2014	3.19	0.32	3.51	2022	3.93	0.44	4.37
2015	3.27	0.33	3.60	2023	4.04	0.46	4.50

[a]Domestic wastewater flows for the City of Hollister. Assumes 2.67% annual increase in flow (Ref: Hollister General Plan).
[b]Wastewater flows for Sunnyslope County Water District. Assumes 4.2% annual increase in flow (Ref: San Benito County Planning).

The DWTP design flow must allow for seasonal increases in flow due to wet weather inflow and infiltration (I/I). Historical peak wet weather flow (PWWF) at the DWTP has exceeded ADWF by as much as 10 percent. ***A design treatment capacity of 5.0 MGD was therefore selected for the DWTP to allow for 10 percent I/I.*** The LTWMP design flows for the DWTP are summarized in the following table:

Summary of Design Wastewater Flows for the DWTP

Flow Condition	Average Dry Weather Flow (ADWF)[a]	Peak Wet Weather Flow (PWWF)[b]	DWTP Design Capacity[c]	Peak Hourly Flow[d]
2023	4.5 MGD	5.0 MGD	5.0 MGD	10.0 MGD

[a]City of Hollister plus Sunnyslope County Water District combined wastewater flow for the year 2023.
[b]ADWF plus 10 percent I/I.
[c]DWTP design capacity = PWWF.
[d]Assumed to be 2.0 times the DWTP Design Capacity.

The flows at the Industrial Wastewater Treatment Plant (IWTP) are not projected to increase significantly in the future because the City does not anticipate additional dischargers to the industrial system. The industrial flows peak at approximately 3.5 MGD during the canning season from July through September. The current annual average flows to the IWTP are approximately 0.65 MGD.

DWTP Treatment

The current DWTP treatment system has a rated capacity of 2.69 MGD. The system must be upgraded to handle the increase in flows projected for this facility. Several treatment alternatives were compared before deciding on an Immersed Membrane Bioreactor (MBR) as the preferred treatment alternative. The MBR process produces a high quality effluent that meets the requirements for disinfected tertiary recycled water under the State of California Title 22 recycled water regulations. The MBR will therefore support the City in meeting its goal of maximizing the reuse of wastewater in the community. The MBR also has the advantage of being directly compatible for use with salinity control processes such as reverse osmosis. The MBR process was selected for the City's long-term wastewater treatment plant because it is a cost-effective and proven state-of-the-art technology that will:

- Protect the City from regulatory change;
- Maximize the City's effluent disposal options;
- Support potential future salinity reduction; and
- Provide an approved Title 22 recycled water technology.

The MBR process combines the principles of activated sludge treatment and membrane filtration. The activated sludge part of the treatment converts soluble waste into an active biomass. The membrane filtration technology is used to physically separate the solids from the treated liquid. The result is an effluent that is uniformly of high quality. Because of the physical barrier provided by the membranes no gravity separation of solids is required in the treatment process train. The solids concentration (biomass) in the biological reactors can therefore be significantly higher than is normally found in conventional activated sludge plants. Because of the higher concentration of biomass the MBR system is less susceptible to variations in flow or loadings when compared to a conventional activated sludge treatment system.

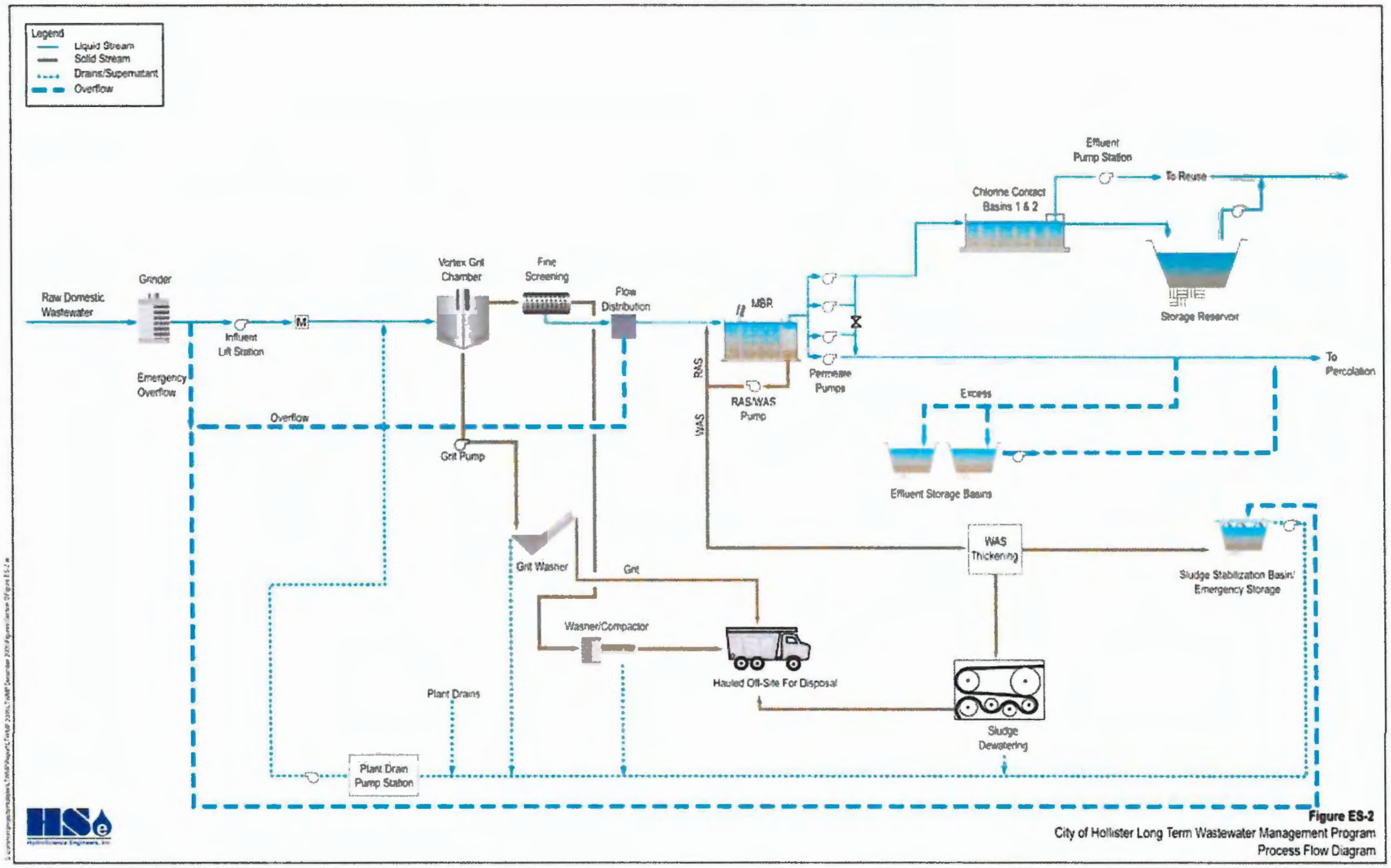
To meet anticipated groundwater limitations, the MBR system will be designed to meet a 5 milligrams per Liter (mg/L) effluent nitrate limit. Although the MBR plant produces a high quality effluent meeting Title 22 requirements, the MBR process does not reduce salinity. The stakeholders have agreed to achieve a lower salinity effluent by 2015 through a combination of activities including source water control, source water treatment, water softener ordinances and wastewater effluent treatment.

The proposed 5.0 MGD MBR facility would be located at the existing DWTP site and would replace the existing DWTP. The general location for the proposed MBR plant and adjacent seasonal storage reservoir is shown in **Figure ES-1.** Construction of the MBR facility would require the partial demolition of a portion of the existing treatment plant to provide space. The new treatment facilities would reuse the existing influent lift station constructed in 2003. A process flow diagram of the proposed MBR treatment plant is shown in **Figure ES-2.** The new facilities at the DWTP will include:

- Grit removal with grit classifier
- Fine screens with screening washer/compactor
- Screened wastewater flow split structure
- Biological process basins (anoxic, aeration and post-anoxic zones)
- Mixed liquor recirculation pump station
- MBR basins to house the membrane filters
- MBR permeate pumps
- Chlorine contact basins
- Plant water and effluent pump stations
- Process blower and membrane blower building
- Solids thickening and dewatering facility
- Solids stabilization basin (utilizing the existing Pond 1A)
- Chemical storage building
- Operations building, including laboratory and maintenance shop
- Septage receiving station
- Odor control biofilter
- Plant drain pump station
- New electrical power service

Figure ES-1: Proposed Location of New DWTP and Seasonal Storage Reservoir

Figure ES-2: Proposed Process Flow Diagram



- Standby power generators
- Plant access/security system
- Instrumentation and control system

Because of the potential for seismic liquefaction in the underlying soils, extensive site remediation to mitigate this liquefaction potential must be included in the project. Vibro-replacement stone columns will be constructed to support the foundation of key structures. The key structures were selected to provide life safety and to provide protection of processes required to keep the plant in-service should a major seismic event occur.

IWTP Treatment

The current treatment capacity of the IWTP is 3.5 MGD. The current annual average flow to the IWTP is approximately 0.65 MGD with seasonal peaks up to 3.5 MGD during the canning season. Since there are no plans for additional flows, the IWTP is adequately sized to meet the City's needs for treatment of the industrial component of its wastewater. At this time no modifications are proposed at the IWTP.

The City, the County and SBCWD are preparing the *Hollister Urban Area Water and Wastewater Master Plan* (Master Plan), which should be complete in December 2006. As part of the Master Plan, a fate analysis of the IWTP will be conducted. The Master Plan will include recommendations for the final disposition of the IWTP. The LTWMP will then be amended to include Master Plan recommendations for the IWTP.

Water Balance

The City's goal is to ultimately dispose of 100% of its effluent through some form of recycled water irrigation. This could include crop irrigation, turf irrigation or spray field irrigation. The RWQCB will generally not allow the application of recycled water for irrigation when saturated soil conditions exist that would result in potential co-mingling of treated effluent with storm water run-off. Therefore, because of local meteorological conditions, plant physiology, and RWQCB permitting constraints, the disposal of effluent by irrigation can be assumed to be limited to the warmer and drier months in Northern California. Generally, these months run from about April until about October. Because the City will only be able to dispose of its effluent on spray fields during the dry months, it must construct seasonal storage reservoirs to store its effluent during the wet season when it cannot dispose of water.

Water balance analyses were performed to determine the amount of seasonal storage required for the two phases of the LTWMP. The water balance assumes there will be between 0.5 – 2.0 MGD of disposal in the existing percolation beds located at the DWTP and management of the remainder of effluent by landscape or spray field irrigation. No expansion of the City's percolation beds is proposed. In Phase I (Interim Effluent Management Project through 2013) it is assumed that the City will dispose of the vast majority of its effluent by spray field irrigation of pasture grass. In Phase II (Recycled Water Project through 2023) it is assumed that the City has implemented its recycled water program and all of the City's effluent is disposed of through recycled water irrigation. A summary of the water balance analyses is presented in the table below:

Summary of LTWMP Water Balance Results

Planning Criteria	Phase I 2008 through 2013	Phase II 2013 through 2023
Seasonal Storage Reservoir (AF)	1,500	2,000
Irrigated Acreage (Acres)	875[a]	1,775[b]

[a]Assumes irrigation of pasture grass with a 100-Year annual irrigation demand of 41.2 inches.
[b]Assumes irrigation of Row Crops or Turf grass with a 100-Year annual irrigation demand of 28.3 inches.

Effluent Storage

A 1,500 acre-feet (AF) seasonal storage reservoir will be constructed to provide sufficient storage for the Phase I Interim Effluent Management Project through the year 2013. The reservoir will be located on the west side of Highway 156 in a portion of the City's existing percolation beds. The reservoir will take up most of the City's parcel on the west side of Highway 156. The reservoir will have perimeter berms approximately 19-feet high. The bottom elevation of the reservoir will be set based upon local groundwater levels and to balance cut and fill soil quantities. This size reservoir will fall under the jurisdiction and requirements of the California Division of Safety of Dams (DSOD). DSOD will require the City to comply with certain requirements for design and construction of the reservoir including DSOD certification of the wastewater impoundment. It may be possible to split the reservoir into two smaller DSOD exempt reservoirs with lower berm height. An exempt wastewater impoundment is defined as an impoundment less than 15-feet high and less than 1,500 AF in volume. The feasibility of splitting the reservoir will be investigated during design.

The seasonal storage reservoir will encompass an area of approximately 77 acres with a maximum water depth of 22-feet and with 3-feet of freeboard. Piping will be routed from the DWTP to the reservoir to provide the City with the means to drain and fill the reservoir. A paved levee road will be constructed on top of the berms to provide the City with access around the reservoir. A concrete boat ramp will be constructed in the reservoir for access. A pump station at the seasonal storage reservoir will pump the stored effluent to the DWTP for distribution. The water in the reservoir will be directed either to the DWTP on-site percolation beds or to the effluent pump station, which will pump the water to the City's effluent management project.

Additional seasonal storage capacity, beyond the 1,500 acre-feet, may be required by 2013. The Phase II Recycled Water Project will require construction of an additional 500 AF of seasonal storage capacity to increase the total storage capacity to 2,000 AF. Expansion of the City's storage capacity may be accomplished by developing additional off-site storage facilities. As the Phase II Project is further defined, the location(s) of additional storage reservoirs will be determined. Selecting a location and construction of this 500 AF reservoir(s) is deferred to a later date in order to integrate the storage location and required volume into the City's Phase II Recycled Water Project. The construction of 500 AF of additional storage in the future may require supplemental CEQA documentation.

Phase I Interim Effluent Management Project

Although it is the stated goal of the City and other participating stakeholders to ultimately provide a high quality wastewater effluent suitable for direct reuse on high value sensitive crops, it is recognized by all parties that full implementation of this goal is not immediately feasible. Because a recycled water project will entail complicated planning, design and implementation efforts, and will form part of a regional water resource issue involving the City, SBCWD and San

Benito County, an interim project has to be implemented while a long-term project is being developed.

Jointly, the City, County, and SBCWD have recommended spray fields as the Phase I Interim Effluent Management Project. Direct reuse on high value crops is not feasible until salinity control measures are implemented. Because it is anticipated that the City's recycled water will initially have Total Dissolved Solids (TDS) levels of approximately 1,200 mg/L, this water will only be suitable for irrigation of plant species that can tolerate elevated salt levels. To assure adequate disposal capacity, spray fields with salt tolerant grasses must be developed during Phase I. The spray fields would be operated with the primary objective of disposing of treated effluent; however, the spray fields may also provide opportunities to irrigate pasture crops.

A Draft Technical Memorandum entitled *Phase 1 Effluent Management Project* (RMC Water and Environment, December 2005) was prepared by the City of Hollister. This TM developed information for the CEQA process, estimated irrigation demands to match projected wastewater effluent flows and develop several alternatives for the Phase I Interim Effluent Management Project. Specific parcels were not identified. Specific sites will be selected on the basis of landowner interest, infrastructure costs, feasibility, consistency with groundwater management plans, adherence to recycled water regulations, environmental constraints, and other concerns. It is anticipated that the specific Phase I project will be developed through a public process performed in conjunction with the environmental review process for the project. The overall Phase I project area is shown in **Figure ES-3**.

The City analyzed three general areas for spray field irrigation disposal within the larger project area. The three areas are: 1) Northeast Area: The area north and east of the DWTP toward the Hollister Municipal Airport; 2) Southwest Area: Areas to the south and west of the DWTP in the Freitas Road area; and 3) Northwest Area: Areas to the far northwest of the DWTP off Highway 25. All three areas have the potential to meet the irrigation requirements of approximately 3,000 acre-feet per year (AFY) or approximately 875 acres of spray field area. In addition to the use of off-site spray fields for effluent management, the City will also continue the use of the remaining on-site percolation beds for effluent disposal.

Additionally, to show the suitability of recycled water for irrigating edible food crops, an agricultural demonstration project is proposed as part of the Phase I Project. The demonstration project would consist of providing a volunteer grower with recycled water that is blended with Central Valley Project (CVP) water to achieve TDS levels of approximately 700 mg/L. The demonstration project would be limited to approximately 40 to 100 acres within the area of San Juan Valley currently served by CVP water. To mitigate salinity for this use, San Felipe water will be conveyed to the demonstration site and blended with the recycled water to achieve a TDS concentration goal of 700 mg/L. This demonstration project would include recycled water and CVP water supply pipelines; a tank for blending; and a pump system to provide pressure for the on-site irrigation system.

Phase II – Recycled Water Project

A *Draft Regional Recycled Water Project Feasibility Study Report* (RMC Water and Environment, May 2005) was prepared for the Water Resource Association of San Benito County (WRA). The WRA consists of the City of Hollister, SBCWD, Sunnyslope County Water District, and the City of San Juan Bautista. The Feasibility Study developed and recommended an Ultimate Regional Recycled Water Project. The Ultimate Regional Recycled Water Project could potentially distribute approximately 16,320 AFY of recycled water as it comes available to agricultural users throughout the San Juan Valley. The Feasibility Study further developed phased implementation sequencing for the Ultimate Recycled Water Project. Following implementation of the Phase I Interim Effluent Management Project, a Phase II Project was identified to deliver recycled water to agricultural users in the Frietas Road area. The Phase II project area encompasses approximately 1,890 acres and has a total estimated irrigation demand of 4,600 AFY. **Figure ES-4** shows the Ultimate Recycled Water Project for the San Juan Valley including the proposed Phase II Project.

The *San Benito County Regional Recycled Water Project Facility Plan-Draft Report* (RMC Water and Environment, December 2005) evaluated three alternatives for supplying recycled water to users in the Frietas Road area for the Phase II project. The alternatives were differentiated by the level of service they would provide users. The alternatives were evaluated based upon economic and non-economic criteria and a Phase II project was recommended that would supply up to 100% of the irrigation demand in the Freitas Road area. The recommended Phase II Recycled Water Project is shown in **Figure ES-5**. Although the Phase II project is the recommended project in the Facility Plan, the City will evaluate the final project based on economic factors including a cost benefit analysis of including into Phase II the infrastructure constructed during the Phase I project.

The Phase II project area has an irrigation demand of approximately 4,600 AFY within an area of approximately 1,890 acres. The total demand of 4,600 AFY equates to 100 percent of the projected wastewater flow at the DWTP for the year 2020. The projected wastewater flow through 2023 is 5,041 AFY. Existing percolation beds will provide approximately 895 AFY of supplemental disposal capacity. By combining the 4,600 AFY recycled water demand with the 895 AFY percolation capacity, the City's effluent management/disposal capacity will total approximately 5,495 AFY by 2023. This exceeds the projected wastewater effluent flow in 2023 and is therefore sufficient for effluent management requirements through the City's General Plan planning horizon.

Future phases of the Ultimate Recycled Water Project beyond Phase II will be developed as recycled water supply increases. This expanded recycled water use would require additional modifications to the recycled water distribution system.

It is anticipated that the Phase II Project will be implemented by 2013. Essential to implementing the Phase II Recycled Water Project are salinity control measures to reduce the wastewater effluent salinity to less than 700 mg/L. The City, County, and SBCWD have entered into a Memorandum of Understanding (MOU) for the preparation of the Hollister Urban Area Water and Wastewater Master Plan. One element of this MOU addresses water quality goals for recycled water. Specifically the MOU states that recycled water shall have a target goal of 500 mg/L TDS and shall not exceed 700 mg/L TDS. Additionally, the MOU states that drinking water shall not exceed 500 mg/L TDS or 120 mg/L hardness. This improved drinking water quality will also improve the quality of the wastewater effluent. The MOU states that these goals should be met no later than 2015. Reaching these water quality goals will require a number of measures.

These measures may include:

- Salinity Education Program
- Industrial Salt Control
- Water Softener Ordinance
- Demineralization of Source Water (wellhead treatment)
- Demineralization of Wastewater Effluent
- Concentration and Disposal of Brine

Figure ES-3: Phase I Interim Effluent Management Project Area

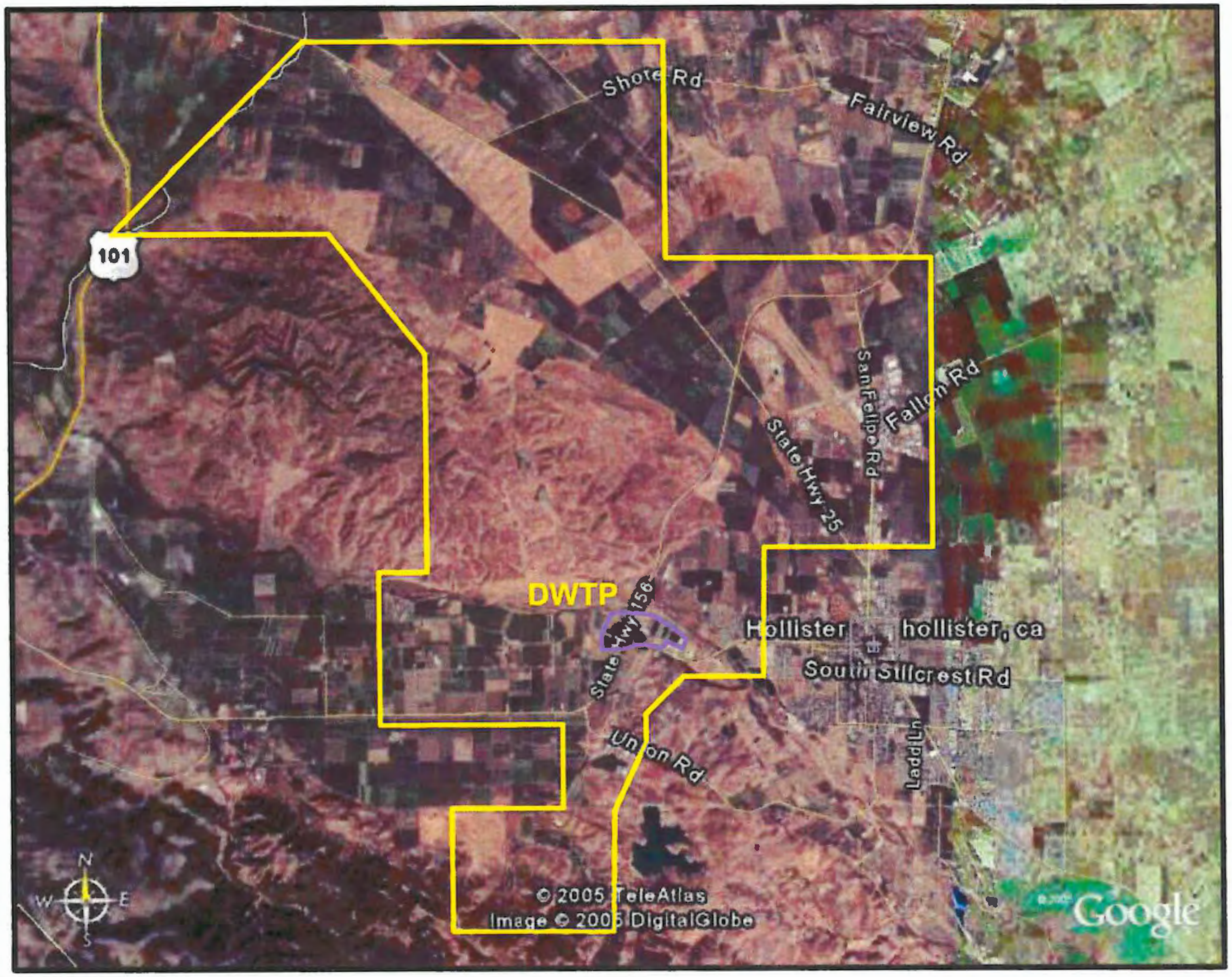


Figure ES-4: Ultimate Recycled Water Project

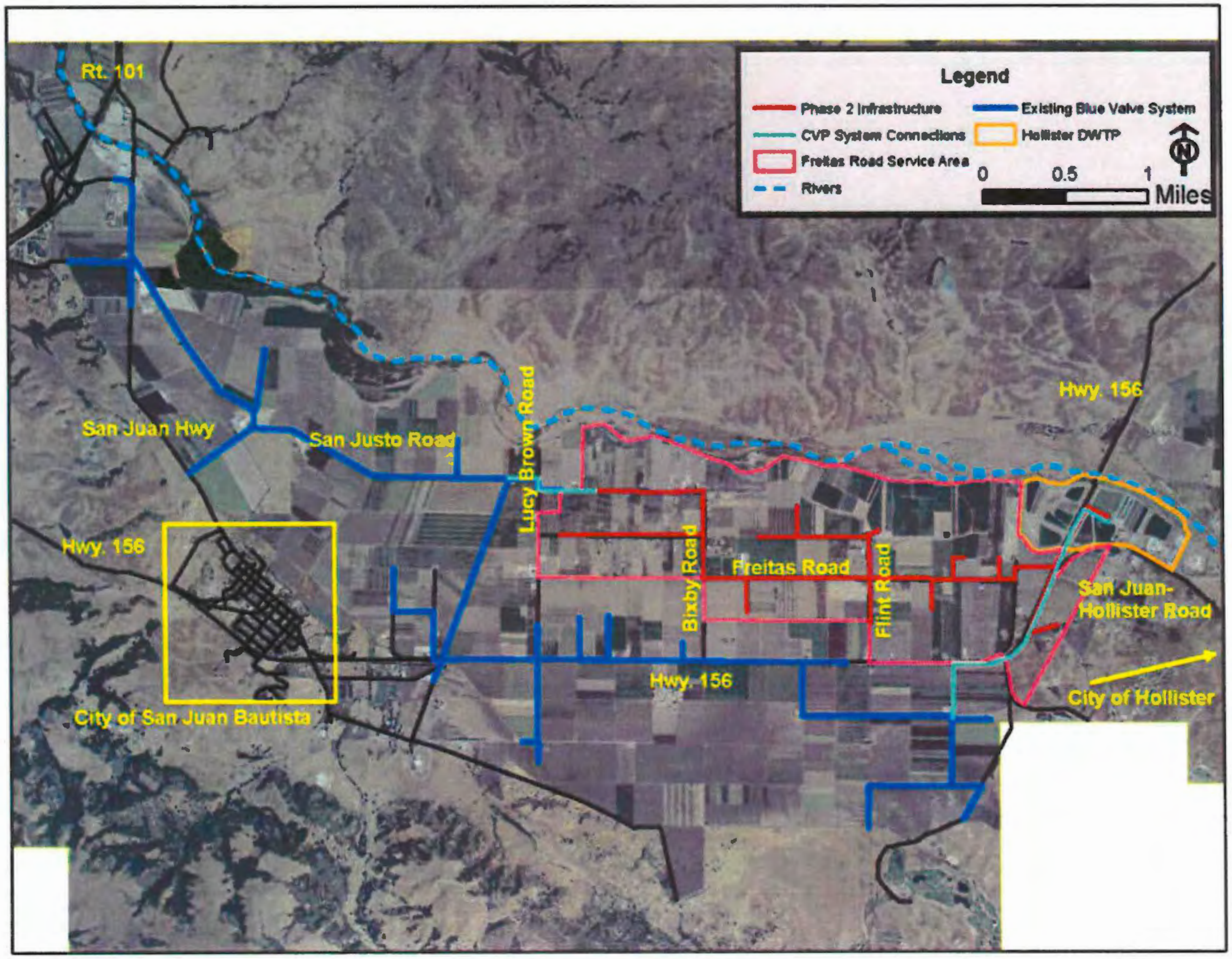
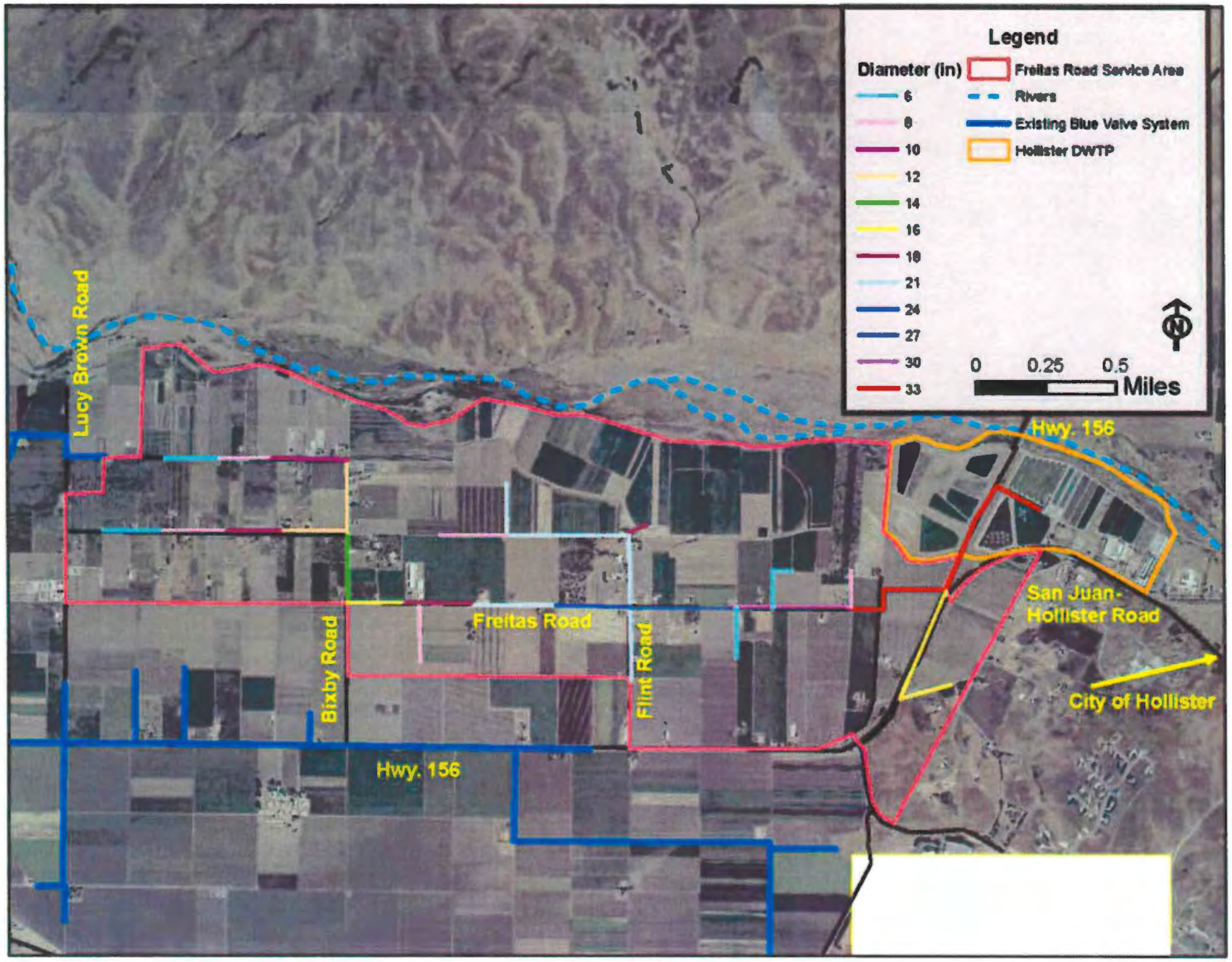


Figure ES-5: Recommended Phase II Recycled Water Project



CEQA Documentation

The City has begun preparation of a California Environmental Quality Act (CEQA) Environmental Impact Report (EIR) for the proposed project. The EIR will include the seasonal storage reservoir, treatment plant, spray fields (Phase I) and Recycled Water Project (Phase II).

Future Considerations

Comprehensive long-term wastewater planning is not possible until the *Hollister Urban Area Water and Wastewater Master Plan* has been completed. This Master Plan will integrate water and wastewater resource management with the regional general plans as well as policy guidelines adopted by the City, County and SBCWD. A major element of the Master Plan will be integration of potable water and wastewater quality improvements, which will result in high quality wastewater effluent suitable for all types of irrigation reuse and protection of the Groundwater Basin. The Master Plan is currently being prepared and is scheduled to be complete in December 2006.

Completion of the Master Plan will trigger an amendment of the LTWMP that will include an update of the implementation plan for the Phase II Recycled Water Project. The LTWMP will also identify specific projects to improve water and wastewater quality to allow reuse of treated wastewater without the need for blending with another source of higher quality water. The IWTP will also be addressed in more detail in the Master Plan.

Project Costs

Preliminary project cost estimates were developed for the various elements of the LTWMP. Capital costs include engineering, administration and construction management costs. Costs are indexed to September 2005 levels and a contingency of 20 to 30 percent of the base capital construction cost (without contractor overhead and profit) is included. The less defined the project element, the higher the contingency percentage that was applied. Costs are based on conceptual level planning and are believed to be accurate from +50 to –30 percent of the actual cost. The costs of land acquisition for the Phase I Project are not included in these costs. It is assumed that the City will negotiate leases with landowners for use of land as spray fields.

Annual operations and maintenance (O&M) costs include the estimated costs for power, chemicals, labor and maintenance of the facilities. The O&M costs for each reuse site are not included in the costs presented below. The site O&M costs are anticipated to be borne by the operator of the site and would be part of the operations agreement between the City and the site operator.

Estimated LTWMP Project Costs

LTWMP Capital Construction Costs Description	Capital Costs ($ millions)[a,b]	Engineering/ Admin ($ millions)	Construction Management ($ millions)[c]	Total Project Costs ($ millions)
Domestic Wastewater Treatment Plant	$ 52.64[d]	$ 5.26[e]	$ 5.26	$ 63.16
Phase I Seasonal Storage Reservoir[f]	$ 13.50[g]	$ 1.35[e]	$ 1.35	$ 16.20
Phase I Effluent Management Project[h]	$ 14.86 – 17.23[g]	$ 2.70 - 3.14[h]	$ 1.34 – 1.55[h]	$ 18.90 – 21.92[h]
Phase I Subtotal	**$ 81.00 – 83.37**	**$ 9.31 – 9.75**	**$ 7.95 – 8.16**	**$ 98.26 – 101.28**
Phase II Recycled Water Project[i]	$ 10.57 - 14.90[g]	$ 1.90 – 2.66[i]	$ 0.94 – 1.33[i]	$ 13.41 – 18.89[i]
Phase II Seasonal Storage Reservoir(s)	$ 4.60 - 7.15[g]	$ 0.92 – 1.43	$ 0.46 – 0.72	$ 5.98 – 9.30
Phase II Subtotal	**$ 15.17 – 22.05**	**$ 2.82 – 4.09**	**$ 1.40 – 2.05**	**$ 19.39 – 28.19**
Total Project Cost	**$ 96.17 – 105.42**	**$ 12.13 – 13.84**	**$ 9.35 – 10.21**	**$ 117.65 – 129.47**

[a] Based on September 2005 ENR construction index for San Francisco (SF CCI = 8265.45).
[b] Includes 10% allowance for Contractor overhead and profit.
[c] Construction Management Costs = 10% of Capital.
[d] Includes 20% Contingency.
[e] Engineering/Administration = 10% of Capital.
[f] Reservoir cost estimate assumes use of local clay soils for compacted clay liner. Use of a synthetic liner would add $ 7 – 8 million in total cost.
[g] Includes 30% Contingency.
[h] Cost estimate is range of costs presented in Technical Memorandum (RMC Water and Environment, 2005).
[i] Cost estimate is range of costs from Facility Plan (RMC Water and Environment, 2005).

Preliminary Annual O&M Costs

Description	Annual O&M Costs ($ millions/yr)
Domestic Wastewater Treatment Plant	$ 3.7
Seasonal Storage Reservoir	$ 0.1
Additional Storage Reservoir	$ 0.1
Phase I Interim Effluent Management Project	$ 0.3 – 0.4
Phase II Recycled Water Project	$ 0.1 – 0.4
Total Annual Cost	**$ 4.1 – 4.7**

Implementation Schedule

Water recycling in one form or another was identified as the only effluent management strategy that met all of the planning and selection criteria of the stakeholders. The Ultimate Regional Recycled Water Project proposed by the Water Resource Association of San Benito County provides the stakeholders with a region-wide plan for water recycling. Full implementation of this project however, can't be accomplished until the City has reduced TDS levels in its effluent to acceptable levels and the recycled water market in the region has been more fully developed.

Because effluent quality and market assurance require additional time to achieve, the City will implement the Phase I Interim Effluent Management Project to reduce effluent percolation into the basin as wastewater flows to the DWTP increase. The use of recycled water to irrigate forage and pasture land has been selected as the best interim project for the City to implement until such time as the Phase II Recycled Water Project can be implemented. It is feasible that some portion of the Phase I Project may be incorporated into the Phase II Recycled Water Project. The Phase I Interim Effluent Management Project will incorporate seasonal storage of recycled water to maximize reuse. It will also include a pilot program to evaluate the feasibility of blending wastewater with imported surface water for use on crops that are more sensitive to TDS than typical forage/pasture crops.

Extensive planning efforts and coordination by the participating stakeholders has contributed to both the knowledge base and policy foundation for managing water resources in the Hollister urban area and northern San Benito County. A key realization derived from this work is that there is not a single, long-term, reasonable, immediately available mechanism to dispose of treated wastewater.

Based on the above considerations, the City of Hollister proposes the following schedule in order to implement a phased recycled water program. The proposed implementation schedule contains milestones for revision and updating of the LTWMP based upon the additional master planning necessary to fully integrate water and wastewater resources to address water quality issues for the basin as well as further development of a local market for recycled water beyond forage and pasture.

Project Schedule

A preliminary schedule with a description of the key milestones for implementing the LTWMP is presented below. This schedule may change due to circumstances beyond the City's reasonable control, such as environmental reviews or delays. A key juncture in the proposed project schedule is scheduled to occur in the spring/summer of 2007. At that time the stakeholders will complete the *Hollister Urban Area Water and Wastewater Master Plan*. That effort will identify integrated work plans for long-term management and quality improvement of wastewater and long-term supply and quality of potable water. The ultimate disposition of the IWTP would also be addressed. Upon completion of the Master Plan, amendments to the LTWMP will be made to incorporate the implementation activities identified in the Master Plan with those identified in the *San Benito County Regional Recycled Water Project Facility Plan*. Additionally, a determination will be made as to whether additional forage/pasture reuse will be necessary prior to full implementation of the Phase II Recycled Water Project.

LTWMP Implementation Schedule

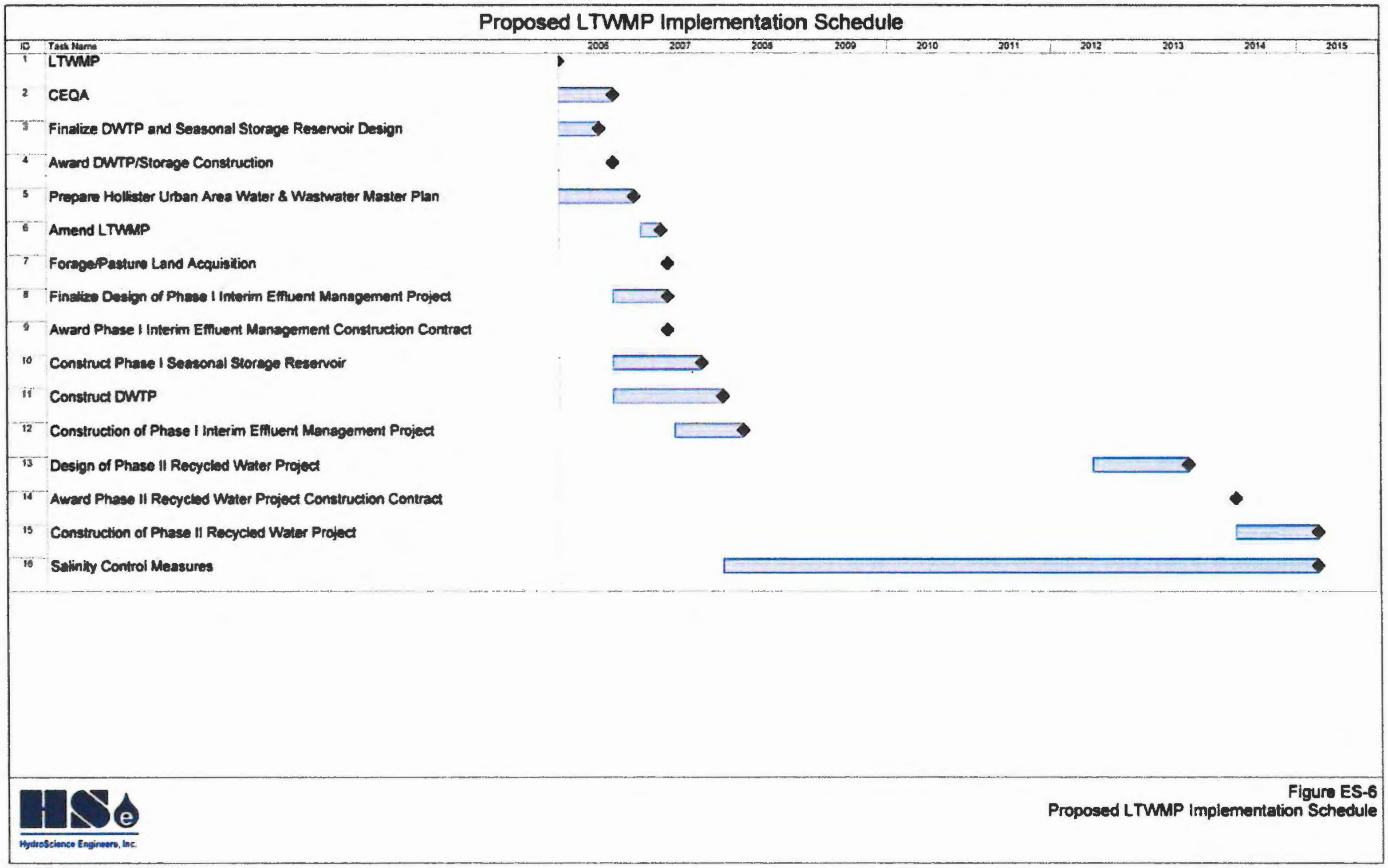
Activity	Completion Date[a]	Constraints/Comments
LTWMP	December 2005	The LTWMP will be submitted to the RWQCB for review and comment.
CEQA	August 2006	Completion of an Environmental Impact Report (EIR) for the LTWMP.
Finalize Design of Treatment and Storage Facilities	June 2006	Design of the DWTP and Seasonal Storage Reservoir will be finalized in conjunction with completion of CEQA review.
Award Treatment/Storage Construction Contract	August 2006	Award of contract for construction of MBR Wastewater Treatment Facility and the 1,500 acre-foot seasonal storage reservoir.
Hollister Urban Area Water and Wastewater Master Plan	December 2006	Completion of Master Plan which integrates water and wastewater resource management with City and County General Plans and policy guidelines adopted by the City, County and San Benito County Water District.
Amend LTWMP	March 2007	The LTWMP will be amended upon adoption of the Hollister Urban Area Water and Wastewater Master Plan. Specific updates to the LTWMP will include: • Identification of specific actions and timelines for implementing the Phase II Recycled Water Project. • Disposition of IWTP. • Identify water quality improvement actions. • Development of additional forage and pasture land (if required). • Update of the implementation schedule (if required).
Acquisition of Forage/Pasture Land	April 2007	In order to complete construction of the Phase I Interim Effluent Management Project concurrently with the DWTP, additional land must be acquired or leased.
Finalize Design of Phase I Interim Effluent Management Project	April 2007	Design of Phase I distribution, pumping and forage/pasture reuse facilities.
Award Phase I Interim Effluent Management Project Construction Contract	May 2007	Construction of the Phase I Interim Effluent Management Project should be completed by start-up of the DWTP.
Complete Construction of Phase I Seasonal Storage Reservoir	September 2007	The Phase I seasonal storage reservoir must be constructed prior to the 2007/2008 wet weather season because the capacity of the City's percolation ponds will be reduced during construction of the DWTP project.
Complete Construction of the DWTP	December 2007	The construction of the DWTP must be completed by December 31, 2007.

Activity	Completion Date[a]	Constraints/Comments
Complete Construction of the Phase I Interim Effluent Management Project	March 2008	Construction of the Phase I Interim Effluent Management Project Facilities must be complete by the end of the 2007/2008 wet weather season.
Salinity Control Program Complete	2015[a]	Completion date set by MOU.
Complete Design of Phase II Recycled Water Project	August 2013[a]	Design of Phase II Recycled Water Project should be scheduled to facilitate completion of construction of these facilities by March 2015 or earlier if recycled water salinity is sufficiently reduced.
Award Phase II Recycled Water Project Construction Contract	March 2014[a]	Construction of the Phase II Recycled Water Project should be complete by March 2015.
Complete Construction of Phase II Recycled Water Project	March 2015[a]	Completion to coincide with achievement of salinity goals by 2015 (Ref: MOU).

[a] Dates may be amended in March 2007 after completion of the Hollister Urban Area Water and Wastewater Master Plan.

The following schedule graphically shows the proposed implementation plan for the LTWMP for the City of Hollister. This schedule shows the project timelines for the treatment, storage, and interim effluent facilities and project planning.

Figure ES-6: Proposed LTWMP Project Schedule



SECTION 1

Introduction

1. Introduction

The City of Hollister (City) retained HydroScience Engineers, Inc. to develop a Long-Term Wastewater Management Program (LTWMP) for reliably treating and discharging the City's domestic and industrial wastewater. As part of this LTWMP, it is the City's goal to maximize the reuse of treated effluent. Pursuant to the California Regional Water Quality Control Board Revised WDR Order No. 00-020 (**Appendix A**) and RWQCB (Central Coast Region) Cease and Desist Order R3-2002-0105 (**Appendix B**) as amended by Order No. R3-2005-0142 (**Appendix C**), the LTWMP must address current wastewater flows as well as future buildout flows and must be implemented by December 31, 2007. This report presents the City's LTWMP and is organized into the following sections:

- Section 1 – Introduction
- Section 2 – Existing Domestic WWTP
- Section 3 – Existing Industrial WWTP
- Section 4 - Wastewater Flows
- Section 5 - Regulatory Requirements
- Section 6 - Wastewater Treatment
- Section 7 - Effluent Management
- Section 8 - Water Balance
- Section 9 - Recommended LTWMP

1.1. Background

The City of Hollister is located in the central coastal region of California at the junction of the San Juan and Hollister Valleys. The City is located in northern San Benito County at the intersection of State Routes 25 and 156, approximately 90 miles south of San Francisco, as shown in **Figure 1-1**.

The City owns and operates two wastewater treatment facilities (Error! Reference source not found.). The first facility is the Industrial Wastewater Treatment Plant (IWTP) for treating seasonal industrial wastewater. The IWTP is located west of downtown Hollister at the west end of South Street and on the north side of the San Benito River. Built in 1971, the IWTP served two canneries until 1992, when one of the canneries discontinued operation. San Benito Foods is currently the only remaining industrial discharger to the IWTP and discharges tomato cannery wastewater from mid-June through mid-October.

In addition to the IWTP, the City also owns and operates a second treatment facility, the Domestic Wastewater Treatment Plant (DWTP), located less than a mile to the west of the IWTP and south of the San Benito River. The DWTP was built in 1979 and treats the City's domestic wastewater, consisting predominantly of residential and commercial customers within the City's service area. The City is responsible for operation, maintenance, monitoring, and reporting for the DWTP and the IWTP.

Since becoming operational, the IWTP has generally complied with the conditions of Waste Discharge Requirement (WDR) Order 90-90, which was issued by the RWQCB in 1990, and is included as **Appendix D,** but at times levels of total dissolved solids (TDS), sodium (Na), and chloride (Cl) are high. The IWTP has experienced elevated levels of TDS, Na, and Cl during canning season discharges, which has resulted in exceedances of the limits in the IWTP's WDR permit for these parameters.

Like the IWTP, the DWTP has also generally complied with the conditions of its WDR Order 87-47, which was issued by the RWQCB in 1987, and is included as **Appendix E**. Beginning in 1993, however, the DWTP began experiencing diminishing capacity through its percolation beds – the sole method of effluent disposal for the DWTP's treated wastewater.

Elevated levels of effluent suspended solids (SS) were suspected of causing the diminished percolation capacity (Dickson et al., 1998) by reducing the pore spaces and consequently restricting flow of treated effluent into the soil matrix. In particular, high algae concentrations in the DWTP effluent appeared to exacerbate the condition since algae are typically larger and less susceptible to removal by gravity settling in the treatment ponds. Numerous measures have been explored to improve the percolation rates, including regular draining, periodic disking of the percolation bed surface, and removal of soil at the bottom of the beds. These measures have generally provided only short-term and limited improvement of percolation capacity.

Over time, the capacity of the DWTP's percolation beds diminished to the point where the ability of the DWTP to adequately and reliably dispose of all domestic wastewater flows became compromised. Consequently, the City explored emergency diversion of domestic wastewater for treatment and disposal to the IWTP, which had surplus treatment and disposal capacity available. It is estimated that up to 7.5 million gallons per day (MGD) of treatment and disposal capacity is available at the IWTP, on a seasonal basis. In November 1998, the City requested approval to divert domestic wastewater flow to the IWTP. The RWQCB granted the City's request and subsequently adopted Order 00-020 in May 20, 2000, allowing temporary diversion of domestic wastewater to the IWTP. A copy of Order 00-020 is included as **Appendix A**.

The extent of the diversion capacity is summarized in **Table 1-1**.

Table 1-1: Summary of Average Monthly Flow (MGD) Limits for the DWTP and IWTP

Flow Type	DWTP	IWTP (Canning Season)	IWTP (Non-Canning Season) [a]
Municipal	2.69	0.18	1.52
Cannery	-	3.50	-
Storm water	-	-	0.20

[a] The canning season runs approximately mid-June through mid-October, and varies from year to year.

During mid-2001 and early 2002, discharges at the IWTP and DWTP resulted in a violation of each facility's WDRs. From June 1, 2001, to March 31, 2002, it is estimated that 6,100 gallons of treated undisinfected wastewater seeped into the inactive San Benito River channel from Percolation Bed 13 of the DWTP. On May 6, 2002, the levee of IWTP Pond 6 was breached, discharging an estimated 15 MG of treated undisinfected domestic wastewater to the San Benito River channel. In addition, the RWQCB staff became concerned that plant influent flow measurements may not have been accurate. The RWQCB issued Cease and Desist Order No. R3-2002-0105, included in **Appendix B**, on October 17, 2002, listing interim milestones for improving performance of the DWTP, including:

- By November 2002 (subsequently revised to March 3, 2003), the City must award a contract for construction and installation of equipment to reduce total suspended solids (TSS) concentrations in treated effluents discharged to the percolation beds of the DWTP.
- By July 2003 (subsequently revised to August 1, 2003), the City must complete construction and initiate use of a new treatment plant headworks at the DWTP to accurately measure influent flow and prevent the emission of nuisance odors at the headworks.

In addition, Cease and Desist Order No. R3-2002-0105 included a compliance schedule for the City to implement the LTWMP. Some conditions of the order are listed below:

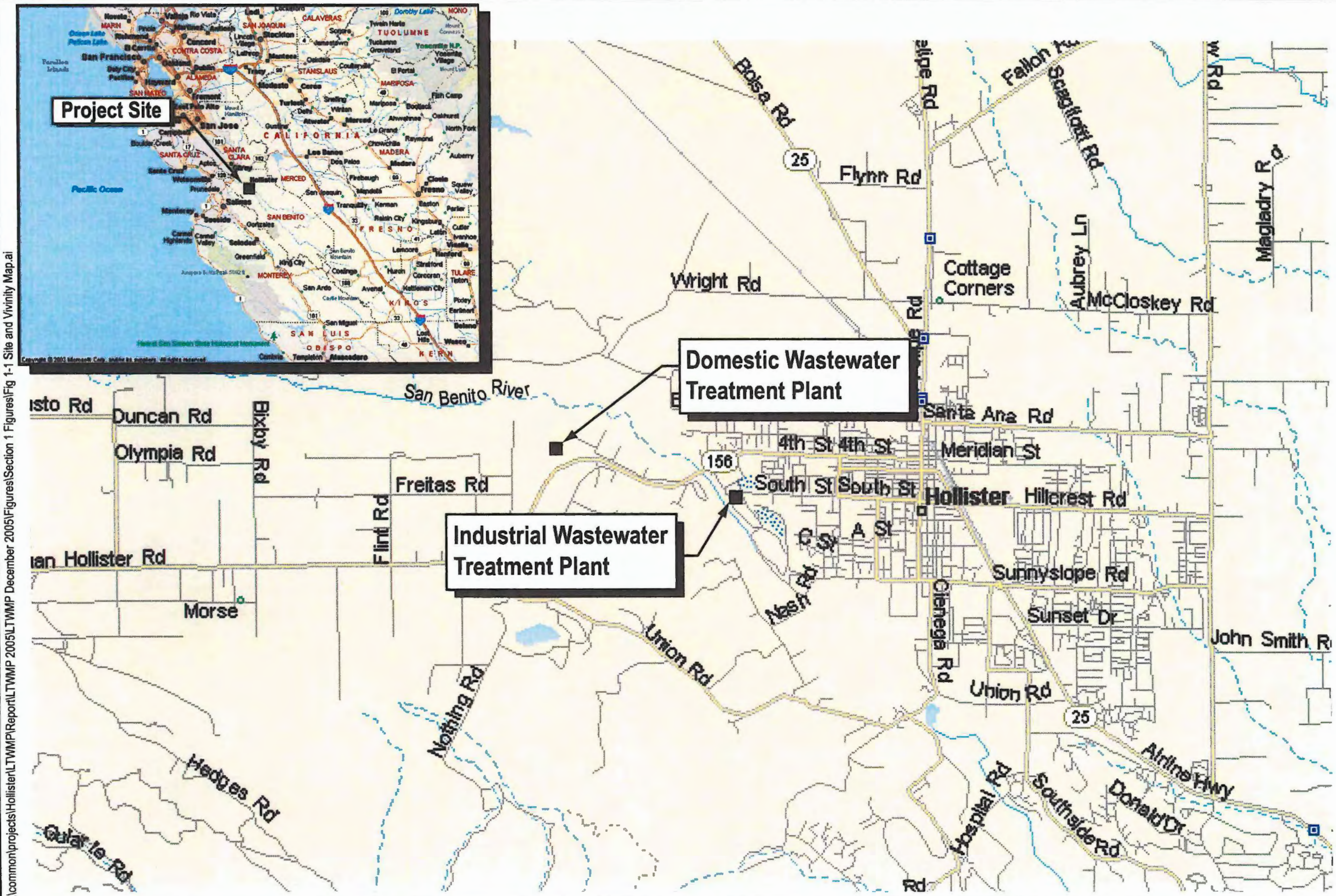
- Domestic wastewater could be diverted on a temporary basis until additional capacity could be added to the DWTP.
- Discharge or diversion of domestic wastewater to the IWTP was prohibited after June 30, 2005.
- A five-year time schedule for development and implementation of the LTWMP was required.
- By May 20, 2002, the City was required to submit a fully developed LTWMP to the RWQCB outlining how that implementation schedule was to be met.
- The City was required to fully implement the LTWMP by May 20, 2005.

On November 1, 2002 the RWQCB adopted Administrative Civil Liability (ACL) Order R3-2002-0097 in response to the release of wastewater from the IWTP to the San Benito River. The ACL assessed the City a civil liability of $1.2M, but suspended $1.176M of the assessment if the City successfully completed certain interim compliance projects. An additional $200,000 of the civil liability would be further suspended upon successful implementation of the LTWMP ***by October 15, 2005***.

The City initiated interim improvements at the DWTP to provide short-term treatment and discharge improvements until the LTWMP could be implemented. Specific objectives for these interim improvements included improving effluent quality, odor control, and flow measurement. These interim improvements introduced considerable changes to the treatment process by converting the original primary pond/advanced integrated pond system (AIPS) into a dual-powered, multicellular (DPMC) process for improved biochemical oxygen demand (BOD) reduction and TSS control.

In addition to the secondary process changes, there were added improvements upstream of the DPMC pond system. To control odors and improve flow measurement, a new influent lift station was constructed and was equipped with a mechanical grinder, an odor control biofilter, and magnetic flow meter. The interim improvement facilities were placed into service in July 2003. To the greatest extent possible, the interim improvements were designed to be incorporated into the LTWMP.

The City submitted an Administrative Draft of the LTWMP to the RWQCB in May 2002, and a Draft in September 2002. The draft report proposed an expanded long-term DPMC pond system with a polishing wetland as the LTWMP. The draft report also presented a higher water quality alternative that would utilize an immersed membrane bioreactor (MBR) system, but at a significantly higher project cost. Comments received from the RWQCB (November 14, 2002) suggested that any new wastewater treatment plant (WWTP) would have to comply with the most stringent nitrate limit as established in the local groundwater basin plan. This was specified in a subsequent letter from the RWQCB (**Appendix F**) as a nitrate (NO_3) limit of 5 milligrams/Liter (mg/L) as Nitrogen. The ability of the proposed wetlands polishing system to consistently meet such a low nitrate limit was unknown. In addition, because the proposed constructed wetlands would eventually overflow to the San Benito River, the RWQCB affirmed the need for a National Pollutant Discharge Elimination System (NPDES) permit for discharge to waters of the U.S. The City and local stakeholders concluded that the NPDES permitting process would be lengthy and potentially controversial. Additionally, preservation of water for beneficial use within the community was identified as an important issue for the community and the wetlands project would essentially export this water resource out of the community. As a result, the City selected the MBR alternative as the best approach to treat its wastewater to meet the strict nitrate limit. The City also elected to abandon the wetlands disposal approach and develop discharge alternatives that don't require an NPDES permit.



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HydroScience Engineers, Inc.

SOURCE: Streets & Trips, 2004

Figure 1-1
City of Hollister Long-Term Wastewater Management Program
Site and Vicinity Map

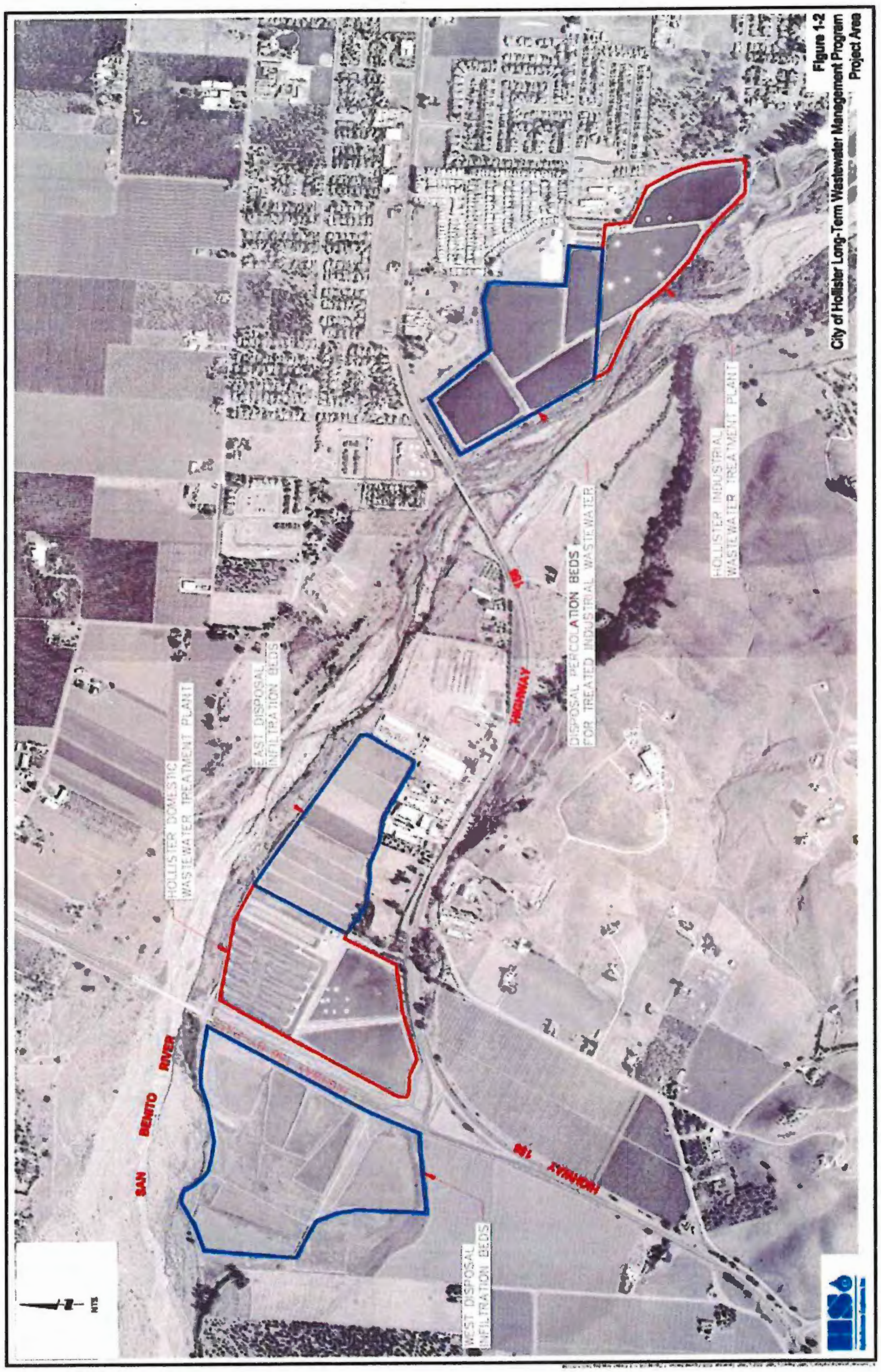

Figure 1-2
City of Hollister Long-Term Wastewater Management Program
Project Area

The City of Hollister is a member of the Water Resources Association (WRA) of San Benito County. The WRA was formed by the City of Hollister, the City of San Juan Bautista, San Benito County Water District (SBCWD), and the Sunnyslope County Water District. The WRA updated its 1998 Groundwater Management Plan (GMP) and prepared a program environmental impact report (PEIR) to facilitate implementation of a variety of groundwater management projects and programs (WRA, 2004). The LTWMP must evaluate discharge options and capacities as well as treatment alternatives within the framework of the WRA's GMP.

Within the Hollister Urban Area dual water supplies and distribution systems shall be required for all new development and for new parks, school grounds, cemeteries and other large landscaped areas. Every reasonable effort shall be made to provide existing park, school grounds, cemeteries and other large landscape areas with water supplies separate from the domestic water system.

In December 2004, the City of Hollister, San Benito County and San Benito County Water District (SBCWD) signed a Memorandum of Understanding, Hollister Urban Area Water and Wastewater Master Plan (MOU). The LTWMP is based on the principles set forth in the MOU. These principles include:

- The Hollister Domestic Wastewater Treatment Plant is the primary wastewater treatment plant for the Hollister Urban Area including areas in the County that are designated to be served by that facility.
- Standards for the quality of wastewater to be discharged shall be developed and agreed to by the City of Hollister, San Benito County and the San Benito County Water District and shall include appropriate consideration of regional issues. These standards shall be the most stringent of local standards, state regulations or federal regulations and shall include careful consideration of anticipated future regulation.
- Wastewater treatment processes and disposal methods shall include careful consideration of future wastewater disposal requirement, shall provide for maximum reuse of wastewater, and shall be agreed to by the City of Hollister, San Benito County and the San Benito County Water District.
- Disposal options and sites shall not:
    - Impact drinking water supplies or negatively impact adjacent land uses or values unless fully mitigated to the satisfaction of the City of Hollister, San Benito County and the San Benito County Water District.
    - Be inconsistent with applicable General Plans or Policies including preservation of agricultural land.
    - Be or result in conditions inconsistent with the quantity, quality or groundwater levels objectives of groundwater management plans for the area of disposal.
- Water and wastewater management shall protect and sustain the local surface and groundwater supplies of San Benito County.
- Drinking water shall have a TDS concentration of not greater than 500 mg/l and a hardness of not greater than 120 mg/l
- Recycled wastewater shall have a target TDS of 500 mg/l and shall not exceed 700 mg/l. This objective shall first be met by rigorous source control and second by demineralization. Blending recycled water with San Felipe water shall only be used as an interim measure to meet these water quality objectives. These objectives shall be met by the measures identified above and the reduction of TDS concentrations in drinking water as soon as practical and not later than 2015.
- Within the Hollister Urban Area all wastewater shall be treated at a central wastewater treatment plant and City and County general plans and supporting public service plans

and implementing Ordinances/Regulations shall be consistent with that requirement. This provision shall not preclude wastewater satellite treatment plants for the recovery of water for local recycling.

The MOU establishes the policy guidelines for completion of an Urban Area water and Wastewater Master Plan that fully integrates water and wastewater resource management, in terms of quality, quantity, and groundwater level and coordinates resource management with City and County General Plans. This Master Plan is scheduled for completion in January 2007. The Master Plan will incorporate integrated work plans for implementation of the Regional Recycled Water Facility Plan and for implementation of quality improvements for both potable water and wastewater to allow for reuse of high quality wastewater effluent without the need for blending.

The City, San Benito County Water District, and San Benito County collaborated in an effort to evaluate alternative strategies for long-term management of effluent from the City's new DWTP. Alternative effluent management strategies evaluated by the agencies included:

- Percolation
- Spray fields
- Wetlands
- Seasonal Storage
- Infiltration Gallery
- Deep Ground Injection
- Export to Water Poor Areas
- Pajaro Pipeline
- Recycled Water
- Ocean Outfall
- Evaporation Ponds

The agencies recommended a long-term wastewater effluent management strategy of 100% Title 22 recycling of wastewater. Until such time as the 100% reclamation alternative can be implemented the agencies recommended interim use of spray fields for effluent disposal. Both the long-term reclamation strategy and interim spray field strategy will require construction of a seasonal wastewater storage reservoir to store water during the wet season when the recycled water can not be applied to spray fields used for recycled water irrigation purposes.

On July 21, 2005 the City requested an extension of the compliance schedule for implementation of the LTWMP. The RWQCB adopted Order No. R3-2005-0142 (**Appendix C**) amending WDR Order No. 00-020, CDO Order R3-2002-0105, and ACL Order R3-2002-0097 to extend the compliance schedule for the LTWMP. This order included the following the following revisions to the LTWMP compliance requirements:

- The LTWMP is to be completely implemented by December 31, 2007.
- The City can continue diversions of domestic wastewater to the IWTP until December 31, 2007.
- The City shall submit an updated LTWMP to the RWQCB for review by December 31, 2005.

1.2. Objectives

This report develops a LTWMP for the City's DWTP and IWTP to meet current and future treatment and discharge requirements. Specific objectives of this study are to:

- Define the City's ultimate goals for wastewater handling consistent with prevailing regional practices and interests,
- Develop preliminary WWTP improvements, implementable by December 31, 2007, that are consistent with the RWQCB's requirement for a long-term wastewater management program, and
- Develop a wastewater effluent management strategy, implementable by December 31, 2007, that is consistent with the RWQCB's requirement for a long-term wastewater management program.

1.2.1. City Planning Criteria

The City Council has defined planning criteria consisting of five requirements for the LTWMP. Treatment and discharge alternatives were evaluated for consistency with the City's planning criteria. The planning criteria outline the City's ultimate objectives for flow projections, discharge standards, treatment process selection, costs, and wastewater reuse, and are summarized in **Table 1-2**.

Table 1-2: City of Hollister Planning Criteria for the LTWMP

Planning Criteria	Objectives
Flow Projections	→ Based on population and development set forth in the City's General Plan. → Flow projections shall include General Plan build-out and allowances for inflow and infiltration (I/I).
Discharge Standards	→ Shall be the most stringent local, State or Federal standards. → Shall consider anticipated future regulatory change. → Standards shall be developed in consultation with San Benito County and the SBCWD and consider regional issues [1].
Treatment Process	→ Wastewater treatment processes shall have been demonstrated to be effective at treating similar types of wastewater to similar levels of treatment without extraordinary O&M requirements.
Cost	→ Treatment and alternatives shall be evaluated on a life cycle cost basis including initial capital, phased expansion capital, operation, maintenance, and repair/replacement costs through buildout.
Wastewater Reuse	→ Maximize beneficial reuse recognizing that this may be dependent upon improving the quality of the source water.

Notes:
1. MOU Hollister Urban Area Water and Wastewater Master Plan, 2004.

1.2.2. Regional Planning Criteria

County or regional interests in the City's wastewater management practices principally focus on two objectives. The first is on maximization of beneficial reuse of treated wastewater. This would include encouraging urban reclamation as well as agricultural irrigation. The second agenda focuses on protection of groundwater quality, with particular attention to TDS and nitrate control. General groundwater impacts should be consistent with the goals of the Central Coast RWQCB Basin Plan Objectives and the ongoing GMP currently under development.

A Recycled Water Feasibility Study was prepared by San Benito County for the WRA (RMC Water and Environment (RMC), May 2005). The purpose of the feasibility study was to identify a cost effective water-recycling project that would meet the needs of the region. To further define the project continued planning efforts led to the preparation of a Recycled Water Facility Plan (RMC, December 2005). In addition, the City, San Benito County, and San Benito County Water District are jointly preparing a Hollister Urban Area Water and Wastewater Master Plan. The LTWMP will need to be consistent with these regional planning efforts.

SECTION 2

Existing Domestic Wastewater Treatment Plant

2. Existing Domestic Wastewater Treatment Plant

This Section provides a background review of the DWTP's existing facilities, current process train, method of operation, discharge practices, and potential deficiencies in treatment and discharge capacity.

2.1. Existing Treatment Plant History

The DWTP was originally built in 1979 and became operational shortly thereafter in 1980. At the time, the DWTP consisted of influent screening, aerated facultative primary ponds (Ponds 1A and 1B), a shallow high-rate secondary pond (Pond 2), two algae settling ponds (Ponds 3A and 3B), and approximately 1.6 acres of percolation beds located to the east of the treatment ponds. The original DWTP process schematic is shown in **Figure 2-1**.

The DWTP was originally an Advanced Integrated Pond System (AIPS). The AIPS uses microorganisms to convert soluble BOD in the wastewater into settleable biomass. For this biological conversion to occur there must be a readily-available supply of oxygen to sustain and promote biomass respiration. Unlike conventional WWTPs, which use mechanical means to supply oxygen, the AIPS relies on oxygen produced by algae within its ponds, namely Pond 2. The goal is to cultivate sufficient algae to provide a low-cost supply of oxygen. Once sufficient BOD has been converted, the algae are separated from the wastewater through the final settling ponds (Ponds 3A and 3B) prior to discharge, per the original design intent.

Following the initial design, the DWTP underwent a series of improvements, which addressed various treatment and discharge deficiencies. In 1987, the City undertook a renovation project that added a new operations building and a new headworks equipped with an influent screen, comminutor, and flow measurement. Seven years later, the existing eastern percolation beds were renovated to improve discharge capacity that had diminished over the years. In 1996, additional discharge capacity was added in the DWTP Percolation Bed Expansion Project. This increased discharge capacity through the development of the western percolation beds. A site aerial of the DWTP after this latest improvement is shown in **Figure 2-2**. Settling algae in Ponds 3A and 3B proved problematic, and the City modified the flow path and operation of the DWTP several times over the years to improve effluent quality and reduce algae levels.

In late 2002, the City began a final series of capital and maintenance improvement projects to the existing DWTP. The first of these improvements began in late 2002, with the development of approximately 50 million gallons (MG) of emergency storage pond volume on the west side of the plant (**Figure 2-3**). In early 2003, the City started a biosolids removal project in Pond 1A as a maintenance effort to dispose of biosolids that had accumulated since the pond became operational in 1980.

2.2. Interim Improvements for the LTWMP

In 2003 the City also constructed interim improvements at the DWTP to provide short-term treatment improvements in plant performance until the LTWMP could be fully implemented. Specific objectives for these interim improvements included improving effluent quality, odor control, and flow measurement. These interim improvements introduced considerable changes to the treatment process by converting the original primary pond/AIPS system into a DPMC process

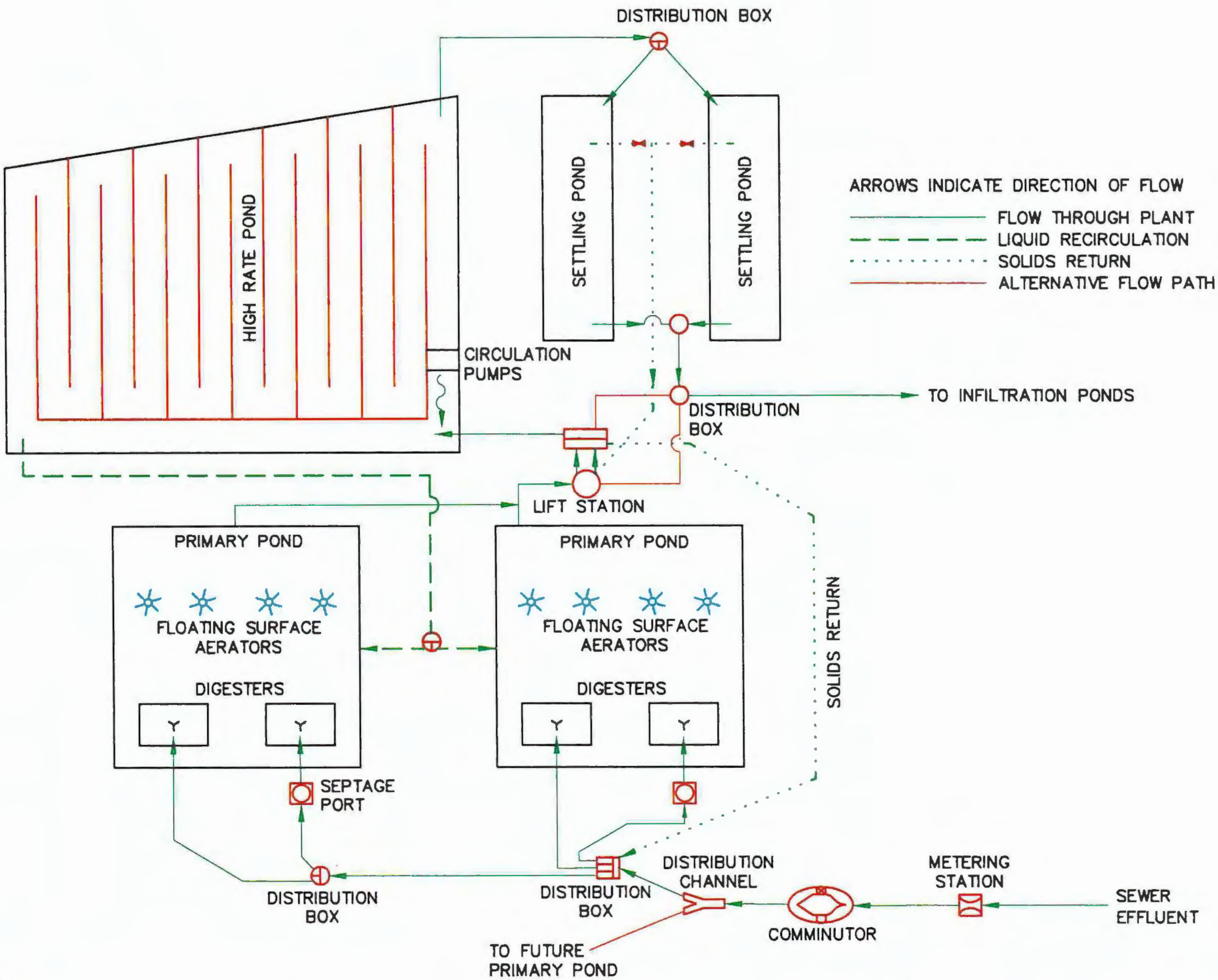

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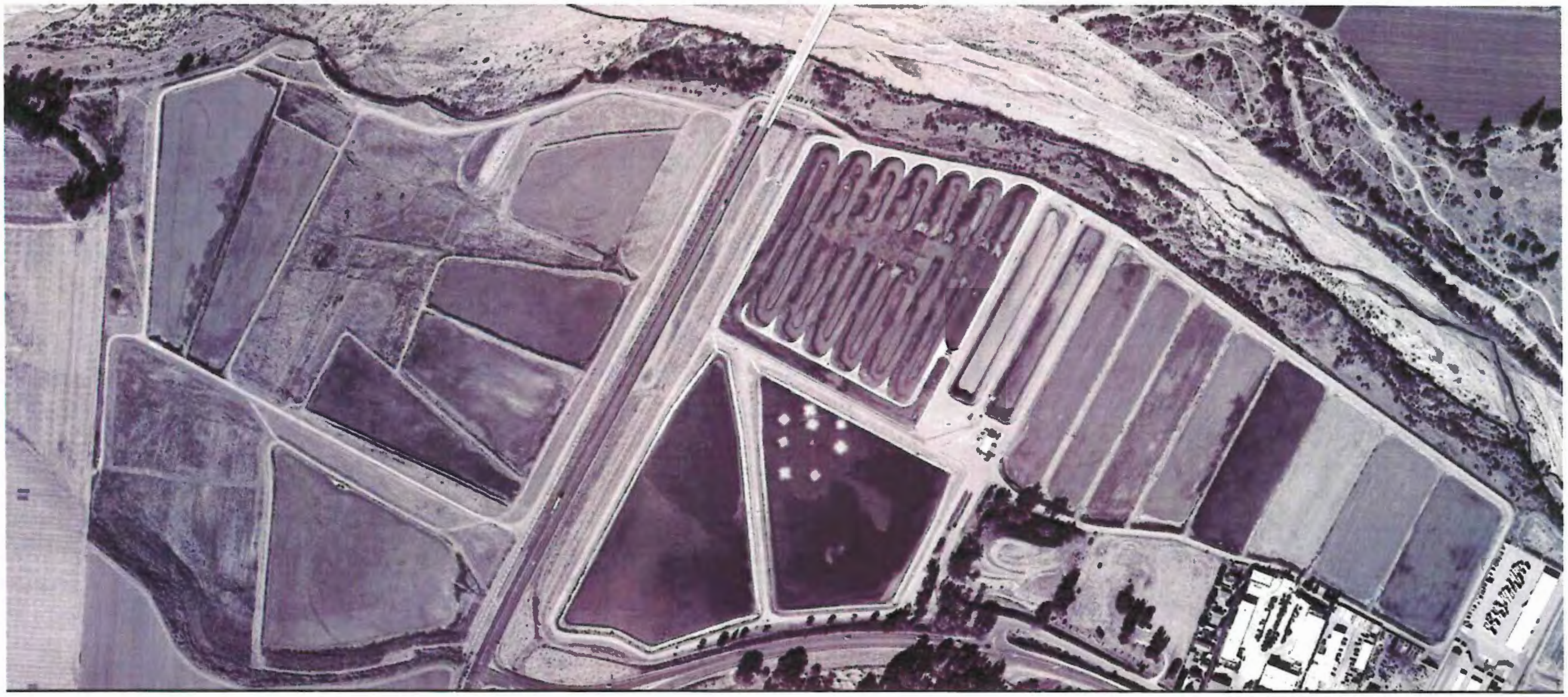
Figure 2-1
City of Hollister Long-Term Wastewater Management Program
Original DWTP Process Flow Diagram



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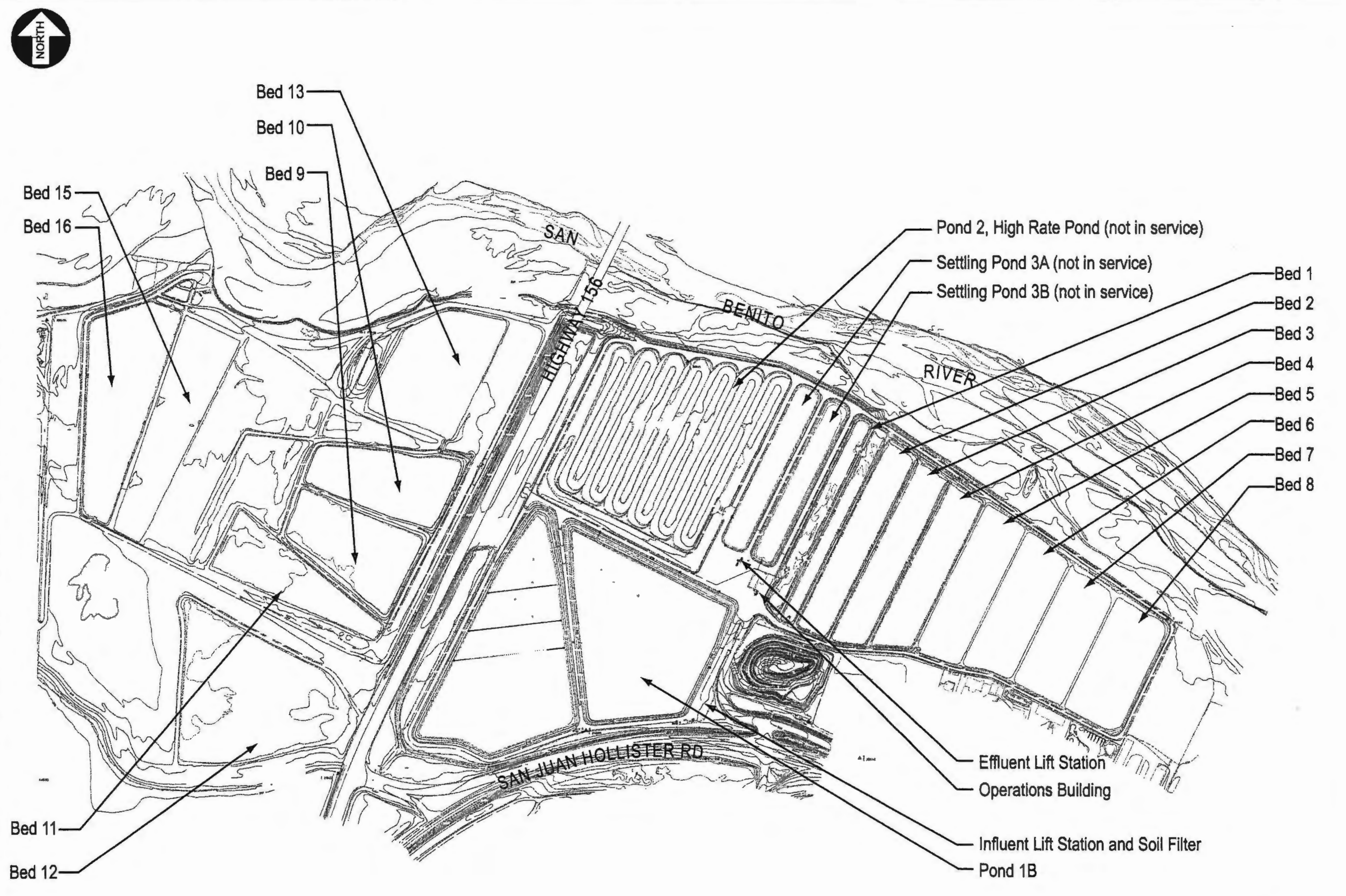
HydroScience Engineers, Inc.

Figure 2-2
City of Hollister Long-Term Wastewater Management Program
DWTP Aerial



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HydroScience Engineers, Inc.

Figure 2-3
City of Hollister Long-Term Wastewater Management Program
Existing DWTP Site Plan

for improved BOD reduction and TSS control. The DPMC system is designed for the permitted 30-day average dry weather flow of 2.69 MGD. In addition to the secondary process changes, there were added improvements upstream of the DPMC. To control odors and improve flow measurement, a new influent lift station was constructed equipped with a mechanical grinder, an odor control biofilter, and magnetic flow meter. The headworks improvements were designed to be incorporated into the final LTWMP.

2.2.1. Phase 1: Headworks Upgrade

Phase 1 of the LTWMP was construction of a new headworks. The flow meter in the existing headworks at the DWTP was nonfunctional due to hydraulic constraints. Flow was measured in an open rectangular channel that also experienced periodic hydraulic constraints depending upon water levels in the DWTP ponds. Flow measurement was also relatively insensitive, and its accuracy was highly dependent upon water levels in the ponds. These problems were exacerbated by the lack of automatic screenings removal at the headworks. The headworks had an intermittently nonfunctioning comminutor and a manually cleaned bar rack which routinely backed up water behind it. The headworks was also a potential source of odors, and the City had received odor complaints for the DWTP.

The City constructed a new headworks on an accelerated schedule. The new headworks included a new grinder; influent wet well and pumps; and new influent flow meter. In addition, the City covered the new headworks and added a foul air biofilter for odor control. The new headworks was also designed to be integrated with any new WWTP design that the City chose to pursue and offered the City the following near-term benefits:

- Improved flow data
- Improved flow hydraulics
- Reduced odor emissions
- Demonstrated the City's commitment to improving wastewater treatment at the DWTP

This phase of the LTWMP was completed in the summer of 2003, and is currently in operation.

2.2.2. Phase 2: Interim Treatment Plant Process Design

The DWTP is currently permitted to treat 2.69 MGD average daily flow (ADF) of municipal-strength wastewater to secondary treatment standards utilizing a modified DPMC pond system. Major plant components, shown in **Figure 2-3**, currently in service include the influent lift station, odor control biofilter, DPMC pond, effluent lift station, and percolation beds for discharge. A general process flow diagram for current DWTP treatment is illustrated in **Figure 2-4**.

Domestic wastewater enters the DWTP through a 36-inch sanitary sewer line and into the newly constructed influent lift station, shown in plan and profile in **Figure 2-5 and Figure 2-6**, respectively. The raw wastewater then passes through a rail-mounted, mechanical grinder, intended to break up large solids, prior to entering the wet well. The raw wastewater is then pumped through a 16-inch magnetic flow meter for flow recording before continuing to the DPMC. To mitigate potential odors, foul air in the wet well air space is collected by a blower through foul air lines and applied to a compost based biofilter for odor control. From the influent pump station, the wastewater undergoes biological treatment through the DPMC system.

The DPMC system utilizes two types of basins for treatment: one complete-mix aeration basin and three partial-mix settling basins (**Figure 2-7**). The complete-mix basin is dedicated to for improved BOD reduction and TSS control. The DPMC system is designed for the permitted 30-day average dry weather flow of 2.69 MGD. In addition to the secondary process changes, there were added improvements upstream of the DPMC. To control odors and improve flow measurement, a new influent lift station was constructed equipped with a mechanical grinder, an odor control biofilter, and magnetic flow meter. The headworks improvements were designed to be incorporated into the final LTWMP.

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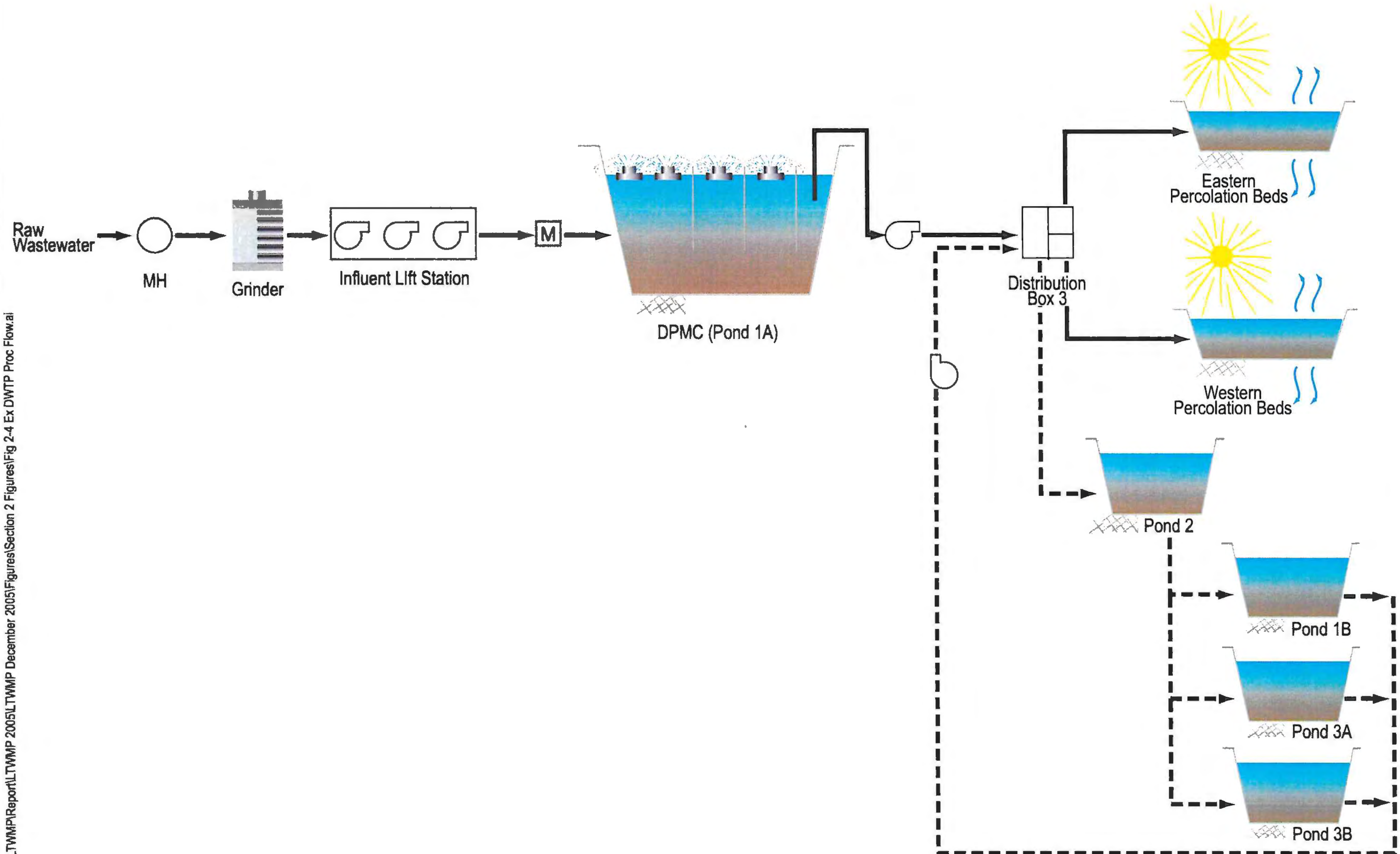

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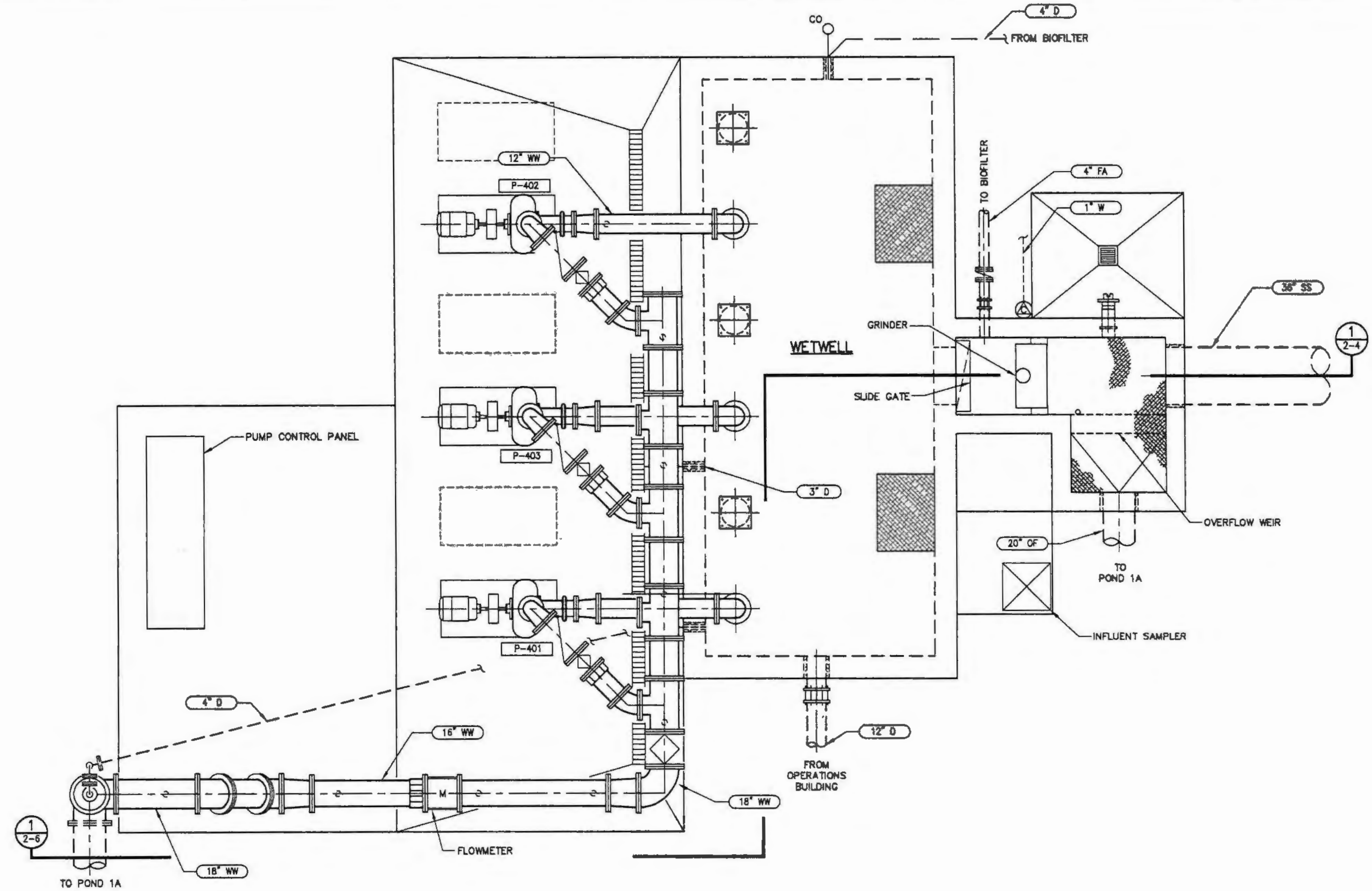
HydroScience Engineers, Inc.

Figure 2-4
City of Hollister Long-Term Wastewater Management Program
DWTP Process Flow Diagram with Interim Improvements

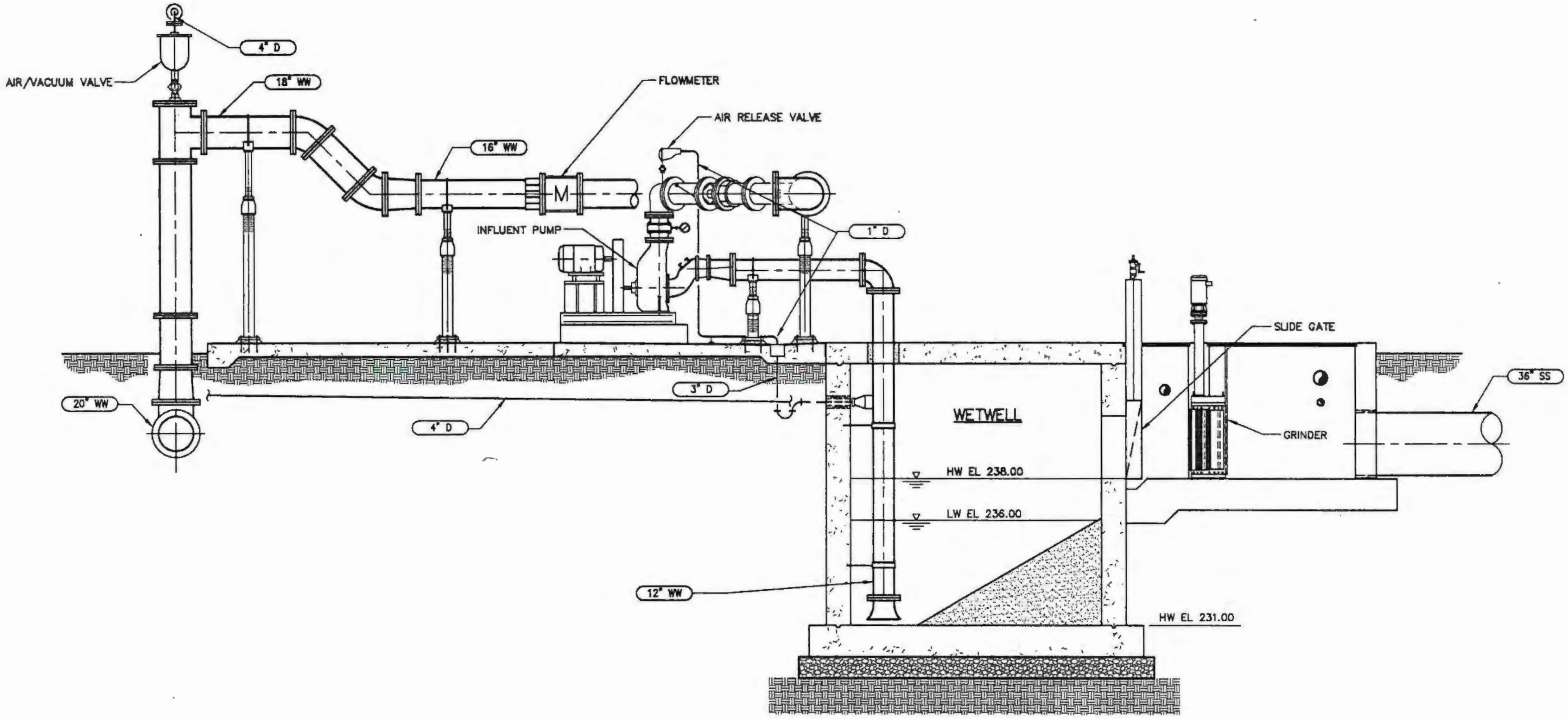


INFLUENT LIFT STATION PLAN

SCALE: 3/16" = 1'-0"

HydroScience Engineers, Inc.

Figure 2-5
City of Hollister Long-Term Wastewater Management Program
DWTP Influent Lift Station Plan



INFLUENT LIFT STATION SECTION (1 / 2-5)

SCALE: 3/16" = 1'-0"

HydroScience Engineers, Inc.

Figure 2-6

City of Hollister Long-Term Wastewater Management Program

DWTP Influent Lift Station Section

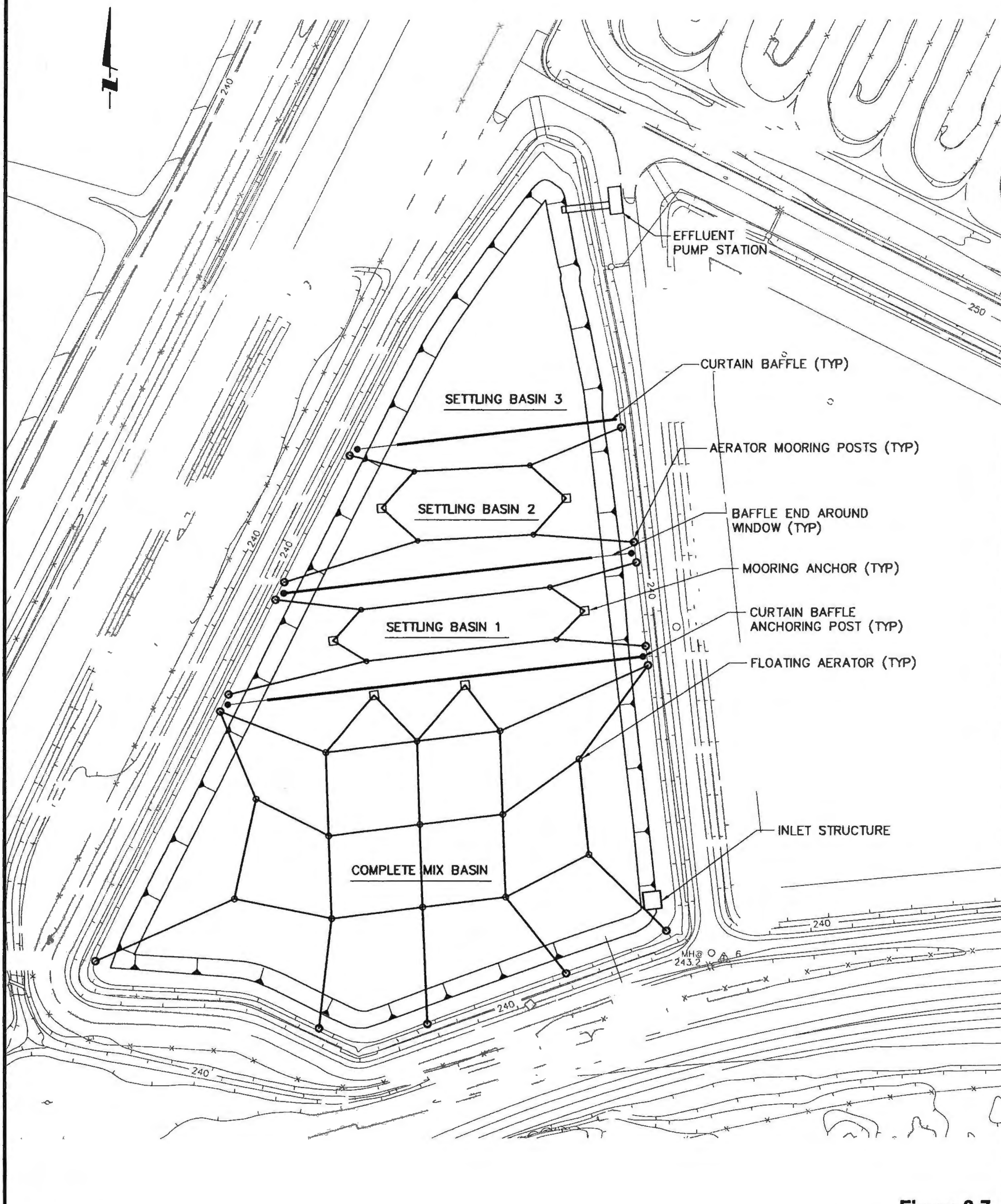


Figure 2-7

City of Hollister Long Term Wastewater Management Program

DPMC Layout Plan

HydroScience Engineers, Inc.

S:\common\projects\Hollister\LTWMP\Report\LTWMP 2005\LTWMP December 2005\Figures\Section 2 Figures\Fig 2-7 OWTP DPMC Plan.dwg DATE 12/23/05 biological treatment for removal of the influent BOD, while the partial-mix basins are used for gravity settling of SS. Compared to the original AIPS design, the DPMC system is able to achieve a higher level of treatment more quickly because biological reactions are no longer limited by the rate of oxygen production from the cultivated algae. Instead, surface aerators totaling 390-hp in the complete mix basin mechanically supply the oxygen necessary to promote BOD uptake.

General design and operational strategy for DPMC systems is similar to other pond-treatment systems – namely, providing sufficient low-powered aeration to achieve BOD reduction. However, unlike conventional ponds that are susceptible to algae growth and blooms, which could impair treatment performance and elevate effluent TSS concentrations, the DPMC system is designed to minimize the potential for algae growth by controlling the basin size and hydraulic detention time (HDT). Specifically, the basins are sized such that the HDT in each cell is shorter than the rate at which significant algae growth can occur.

Pond 1A, which was previously in service as a storage basin, was converted into the DPMC system. Wastewater enters through the southeastern corner of Pond 1A and flows through several separate zones in Pond 1A. As shown in **Figure 2-7**, floating curtain baffles partition the pond into three distinct regions – one complete-mix aeration basin and two partial mix settling basins.

After biological treatment, DPMC effluent is pumped either to the percolation beds for discharge, or, depending on the available discharge capacity, to temporary storage at either Ponds 2, 1B, 3A, or 3B for later discharge. Wastewater is discharged into percolation beds located to the east and west of the main DWTP treatment ponds. The City utilizes 7 beds on the west side of the SR-156 bypass, covering approximately 30 acres, and 8 percolation beds on the east side of the SR-156, covering approximately 25 acres. The 1998 Effluent Handling Capacity Study (Dickson et. al., 1998) estimated the total percolation capacity of the combined east and west percolation beds to be 2.5 MGD. This assessment was based on information from a hydrogeological assessment of the site, plant records, and previous engineering studies (Bracewell Engineering, Inc., 1997). It further assumed the following conditions would apply:

- 0.3 MGD of evaporative and infiltrative losses at the treatment ponds, and
- Near optimum operation of the percolation beds, which would involve frequent dosing to shallow depths and periodic manipulation, such as by disking, harrowing, and/or ripping of the ponds' surfaces.

These percolation beds should be operated in batch mode whereby each pond is loaded, temporarily placed out of service when full, and allowed to dry and rest. Periodically, the surface soil is manipulated with a tractor and disc or harrowed to mix dried algae with the soil to further improve permeability.

Pursuant to the RWQCB's requirements, the capacity of the percolation beds were reevaluated on May 28, 2002, to determine the extent that the percolation rates may have been affected by changes in local DWTP operations, surrounding groundwater management practices, meteorology, and hydrogeology since the 1998 assessment. This desktop evaluation estimated the net percolation bed capacity at 3.5 to 4.0 MGD during the summer and 2.3 to 2.7 MGD during the winter (Schmidt, 2002). Actual operating experience with the percolation beds suggests that the actual percolation rates are even lower (See **Table 8-2**).

However, the City currently treats approximately 2.69 MGD of wastewater at the DWTP and has insufficient capacity in its existing DWTP percolation beds to operate the beds according to this method, especially during the winter months when the capacity of the percolation beds decrease significantly. As a result, the City must divert some domestic wastewater to the IWTP during the winter, as permitted by Order 00-020 and amended by Order No. R3-2005-0142 (**Appendix C**). This will continue until the LTWMP is implemented. The existing percolation beds east and west of the SR-156 bypass are currently in use and will continue to be used. The City disposes of 100% of its effluent through groundwater percolation of treated effluent at the DWTP and at the IWTP. Unit process design criteria for each process after the Interim Treatment Improvements are summarized in **Table 2-1**. A summary of each unit processes' individual capacity is summarized in **Table 2-2.**

Percolation bed capacity is not adequate to meet the City's long-term discharge needs. Additional discharge capacity will need to be added to provide the DWTP with a reliable long-term discharge avenue. Additional effluent management alternatives are discussed and evaluated in **Section 7**.

Table 2-1: DWTP Unit Process Design Criteria after Interim Treatment Improvements[a]

Design Criteria	Design Data
Raw Wastewater	
ADF	2.69 MGD
Peak day flow	4.00 MGD (DPMC design criteria)
BOD	270 mg/L
TSS	315 mg/L
Grinder	
Type	High flow duplex grinder
Number	1
Capacity	8.0 MGD
Power	5 hp
Influent Lift Station	
Pump type	Self priming
Number of pumps	2 VFD 1 constant speed
Capacity	4.0 MGD variable frequency drive (VFD) 4.0 MGD (constant speed)
Size	30 hp
Total dynamic head (TDH)	23-ft
Influent Flow Measurement	
Type	Magnetic flow meter
Number	1
Size	16-inch
Odor Control Biofilter	
Type	Compost media filter
Area	130 sf
Flow	390 cfm
Loading rate	3 cfm/ft^2
Blower operating power	1.58 hp
Blower pressure	10-inch water column
DPMC	
Complete Mix Zone:	
Depth	8 ft
Volume	12.6 MG
HDT at minimum daily flow	6.3 days
HDT at 30-day ADF	4.2 days
HDT at peak daily flow	3.2 days
Total Aeration Horsepower (hp)	390 hp
Aeration hp per MG	45.9 hp/MG
Number of aerators	13
Size of aerators	30 hp
Type of aerators	Floating spray

Design Criteria	Design Data
Partial Mix Zone:	
Depth	8 ft
Volume	8.5 MG
HDT at minimum daily flow	3.4 days
HDT at 30-Day ADF	2.3 days
HDT at peak daily flow	1.7 days
Total aeration hp	40 hp
Aeration hp per MG	4.4 hp/MG
Number of aerators, total	8
Size of aerators	5 hp
Type of aerators	Floating spray
Effluent Lift Station	
Pump type	Self priming, constant speed
Number of pumps	3
Capacity (each)	3.0 MGD
Hp (each)	40 hp
TDH	40-ft
Effluent Flow Measurement	
Type	Magnetic flow meter
Number	1
Size	16-inch
Percolation Beds	
Number	15
Surface area	24.8 acres, net eastern beds 30.7 acres, net western beds

[a] Abstracted from the January 2003, Preliminary Design Report for Interim Improvements at the Hollister DWTP (HydroScience Engineers, 2003a).

Table 2-2: Major Unit Process Capacities after Interim Treatment Improvements (MGD)

Process	Flow criteria	1979 [a, f]	1987 [b, f]	2003
Influent Lift Station	PWWF [c]	–	–	8.00
DPMC Pond 1a	ADF [d]	–	–	3.00
Effluent Lift Station	ADF [c]	–	–	3.00
Lift Station	ADF [d]	1.76	3.30	3.30
Land Discharge	ADF [d]	1.76	3.30	3.50 - 4.00
Land Discharge	AWWF [e]	1.76	4.60	2.30 - 2.70

[a] Original design.
[b] After DWTP upgrade.
[c] Peak wet weather flow (PWWF).
[d] Average dry weather flow.
[e] Average wet weather flow (AWWF).
[f] Abstracted from the 1997 Master Plan Update for the DWTP (Bracewell Engineering, 1997).

2.3. Current Plant Operations

Current treatment and discharge capacity deficiencies at the DWTP (after Interim Improvements) were evaluated. Potential deficiencies in each area are discussed below.

2.3.1. Treatment

There are currently no known performance deficiencies at the DWTP that impair the plant's ability to meet existing WDR conditions. The interim improvements addressed previous treatment deficiencies related to flow measurement, odor control, and mitigation of SS concentration. With the DPMC in operation, BOD and SS concentrations have been reduced consistently below 60 mg/L each, as required by Cease and Desist Order R3-2002-0105 (**Appendix B**).

The interim and long-term improvements are pursuant to California RWQCB Central Coast Region Cease and Desist Order R3-2002-0105 (**Appendix B**), which required implementation of improved treatment and discharge facilities by October 15, 2005 (subsequently revised to December 31, 2007).

2.3.2. Effluent Management

Completion of interim improvements and changes in operations staff have improved and provided more consistent wastewater effluent management at the DWTP. Despite these improvements, hydraulic capacity limitations at the existing eastern and western percolation beds prevent these beds from being capable of meeting the long-term wastewater disposal needs of the City. Disposal capacity to the percolation beds remain at less than 2.69 MGD through much of the year, and temporary diversion of domestic wastewater to the IWTP remains necessary. Diversion was allowed through June 30, 2005 per WDR 00-020. This date was later revised to December 31, 2007. After this date, additional discharge capacity commensurate with the anticipated future wastewater flows is required.

Long-term improvements are required at the DWTP as a result of current treatment and discharge capacity deficiencies. Because the City must have its new DWTP operational by December 31, 2007, it must also have sufficient wastewater effluent management capacity in place at the same time. Long-term effluent management strategies are evaluated in **Section 9**.

SECTION 3

Existing Industrial Wastewater Treatment Plant

3. Existing Industrial Wastewater Treatment Plant

This Section provides a background review of the IWTP's existing facilities, current process train, method of operation, discharge practices, and potential deficiencies in treatment and discharge capacity.

3.1. Existing Treatment Plant History

The IWTP was originally built in 1971 and is located approximately three-quarters of a mile to the east of the DWTP (**Figure 1-1** and **Figure 1-2**). Originally, the IWTP consisted of influent screening, two sedimentation ponds, aeration ponds (Ponds 1 and 2), and approximately 36.1 acres of percolation beds located to the east of the treatment ponds.

The IWTP was originally designed to treat high-strength industrial wastewater from two industrial dischargers. As of 1992, there was only one seasonal industrial discharger, San Benito Foods, discharging to the IWTP. San Benito Foods is a tomato processing facility operating during the summer and early fall months, typically from July to October.

As originally designed, wastewater first flowed through two settling basins for removal of large settleable solids. From the settling basins, wastewater flowed through two aeration ponds for the biological conversion of organic matter in the wastewater. For this biological conversion, there must be a readily-available supply of oxygen to sustain and promote biomass respiration. Approximately 25 floating surface aerators are located in Ponds 1 and 2 to supply oxygen. From the aeration ponds, the treated effluent was sent to the percolation beds for discharge.

Following the initial design, the IWTP underwent a series of improvements that addressed various treatment and discharge deficiencies. In 1973, a sludge storage lagoon, Pond 5A, was created by constructed a berm within a portion of the original Pond 5 to store the sludge collected in the settling basins. Approximately eight years later, an additional percolation bed, Pond 7, was constructed along the San Benito River for increased discharge capacity at the IWTP. However during the winter of 1997-1998, Pond 7 was destroyed by river erosion and has not been rebuilt.

In 1988, the operational strategy of the IWTP was modified in response to the improved pretreatment of industrial wastewater. Specifically, the canneries improved screening of their wastewater streams prior to discharge into the industrial sewer-storm drain system. The volume of large solids in the influent wastewater that had to be removed was reduced. As a result, the two sedimentation ponds were bypassed and the influent flow was diverted directly to the treatment ponds, Ponds 1 and 2. With the sedimentation ponds bypassed, the sludge storage lagoon, Pond 5A, was also taken out of service.

The IWTP operated in this mode up until 2001 when the City requested and received permission from the RWQCB to divert peak domestic wastewater for treatment and discharge at the IWTP on a temporary basis. In preparation for this modification, the City upgraded the influent headworks to the IWTP with a new mechanical screen to remove floatables from the influent domestic wastewater stream. Modifications to the secondary pond lift station were also made to allow effluent from Pond 2 to be pumped to all discharge beds in operation. A site aerial of the IWTP after this latest improvement is shown in **Figure 3-1**.

3.2. Process Design

The IWTP is currently rated to treat a monthly average of 6.10 MGD during the canning season and 2.60 MGD the rest of the year to secondary treatment standards utilizing a conventional aerated pond treatment system (although it is currently permitted for 3.5 MGD during the cannery season and 1.72 MGD during the non-canning season). As shown in **Figure 3-2,** major plant components currently in service include the influent headworks, two aeration ponds, and four percolation beds for discharge. A general process flow diagram for the current IWTP treatment is illustrated in **Figure 3-3**.

Currently, industrial wastewater from San Benito Foods and any diverted domestic wastewater are conveyed to the headworks of the IWTP through the industrial sewer-storm drain system. The raw wastewater passes through a mechanical grinder, which is intended to reduce the size of large materials in the raw wastewater, or a 4-inch bar screen. The raw wastewater continues into a grit chamber for additional solids removal, then a 12-inch Parshall flume for influent flow recording, until it is finally directed out to the treatment ponds.

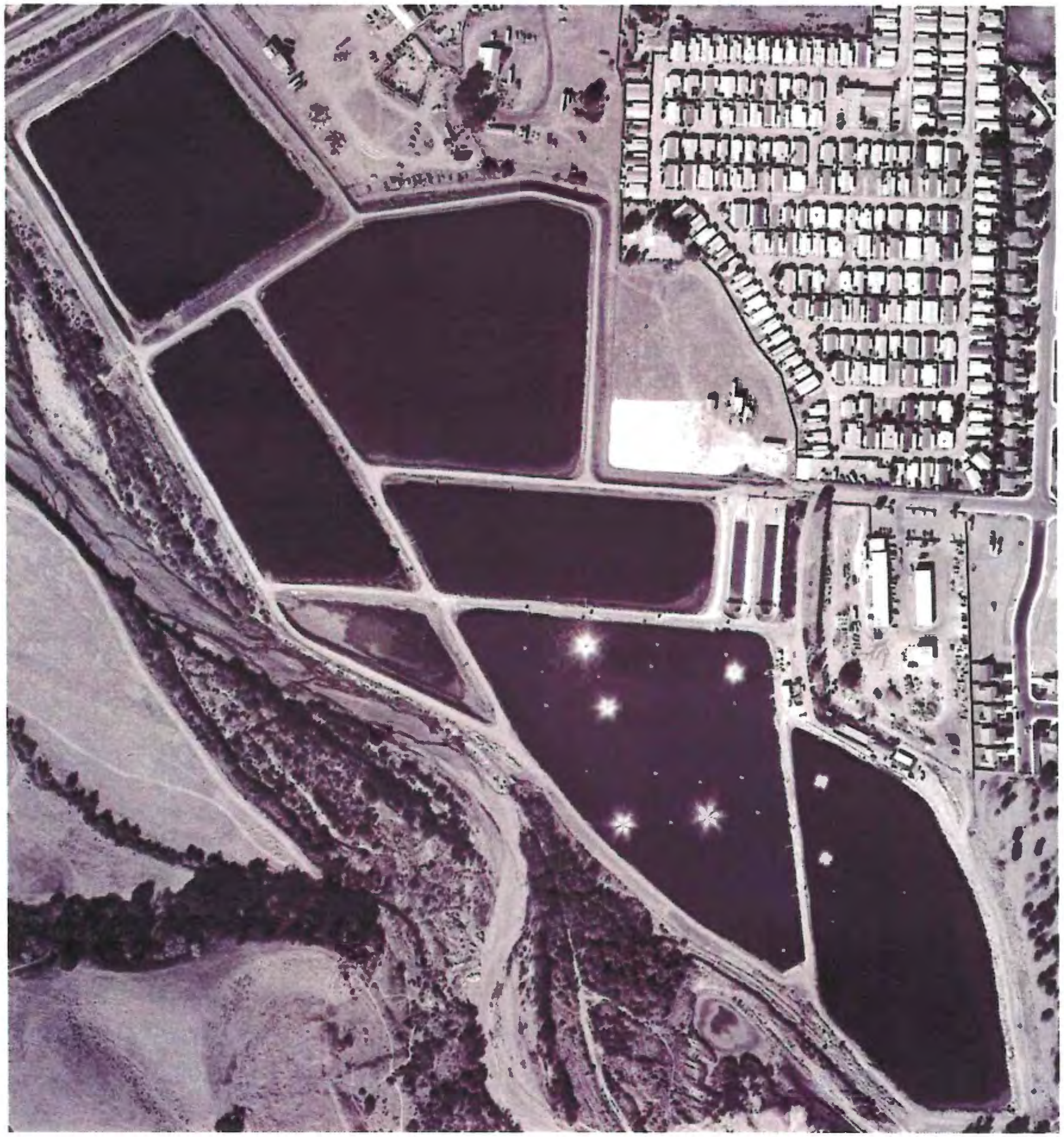
During normal operation the raw wastewater bypasses the primary settling basins and flows directly into Pond 1 because improved pretreatment screening at the cannery decreased the need for solids removal in the settling basins. The current plan of operation utilizes these two settling basins only as a backup mode of operation when additional solids removal is required.

Pond 1 is a facultative aerated pond consisting of 12 acres divided into two zones. The first zone, Pond 1A, has a depth of 26 feet (ft) and zone 2, Pond 1B, has a depth of 24.5 ft. Pond 1 provides 1,575-hp of surface aeration to mechanically supply oxygen for BOD removal. Effluent is then discharged to Pond 2 by means of two overflow weirs.

Pond 2 also operates as a facultative aerated pond with an area of 9 acres and a maximum water depth of 10 ft. Five surface aerators in Pond 2 provide a total of 100-hp of surface aeration. A baffle curtain is located in Pond 2 to minimize short circuiting. After treatment, the effluent is pumped to the percolation beds for discharge.

The percolation beds are operated in batch mode whereby each bed is loaded, temporarily placed out of service when full, and allowed to dry and rest. Periodically, the surface soil is manipulated with a tractor and disc or harrowed to mix dried algae with the soil to further improve permeability.

Unit process design criteria for each process are shown in **Table 3-1**. A summary of each unit process capacity is summarized in **Table 3-2**.



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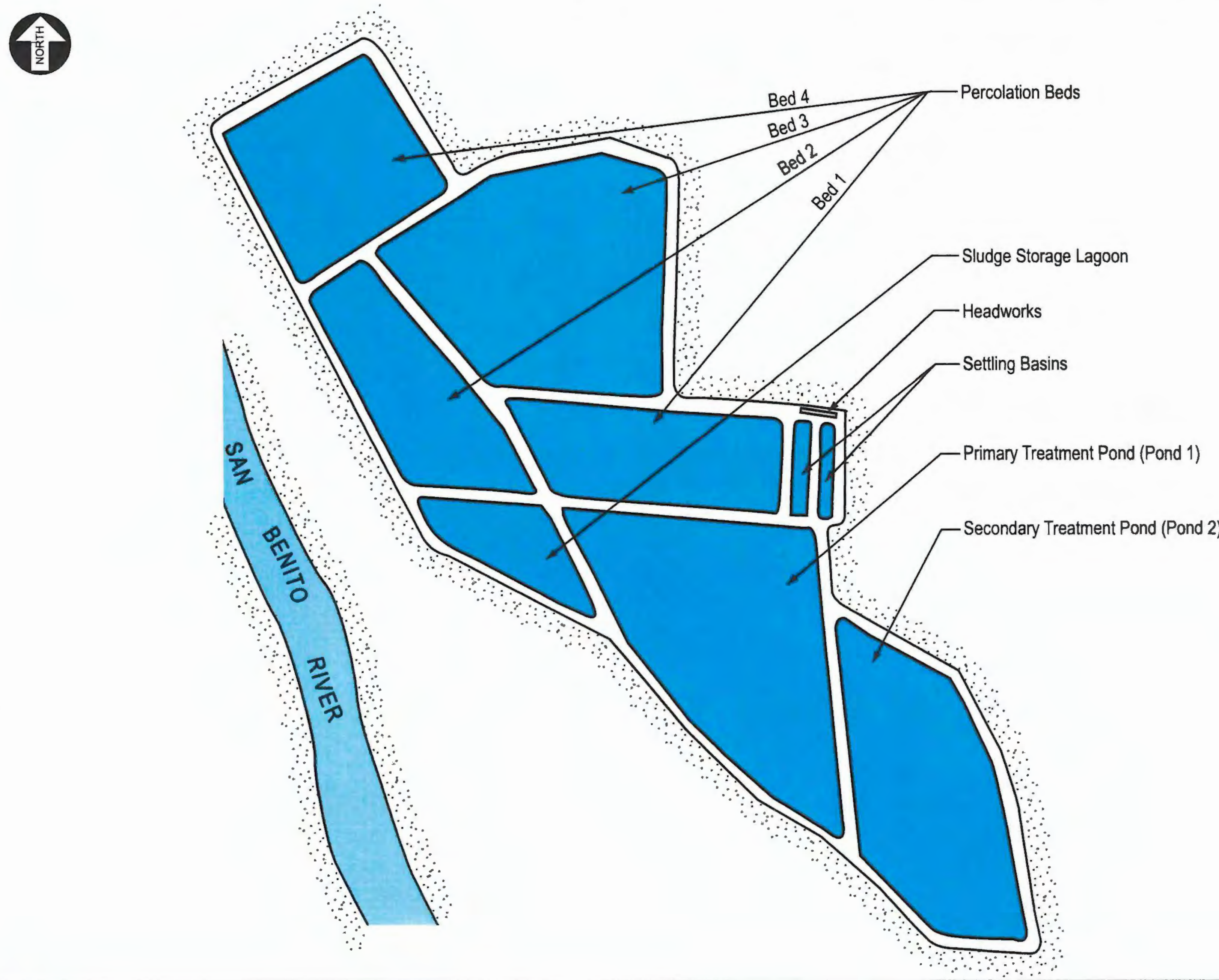
HydroScience Engineers, Inc.

Figure 3-1
City of Hollister Long-Term Wastewater Management Program
IWTP Aerial



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HydroScience Engineers, Inc.

Figure 3-2
City of Hollister Long-Term Wastewater Management Program
IWTP Site Plan

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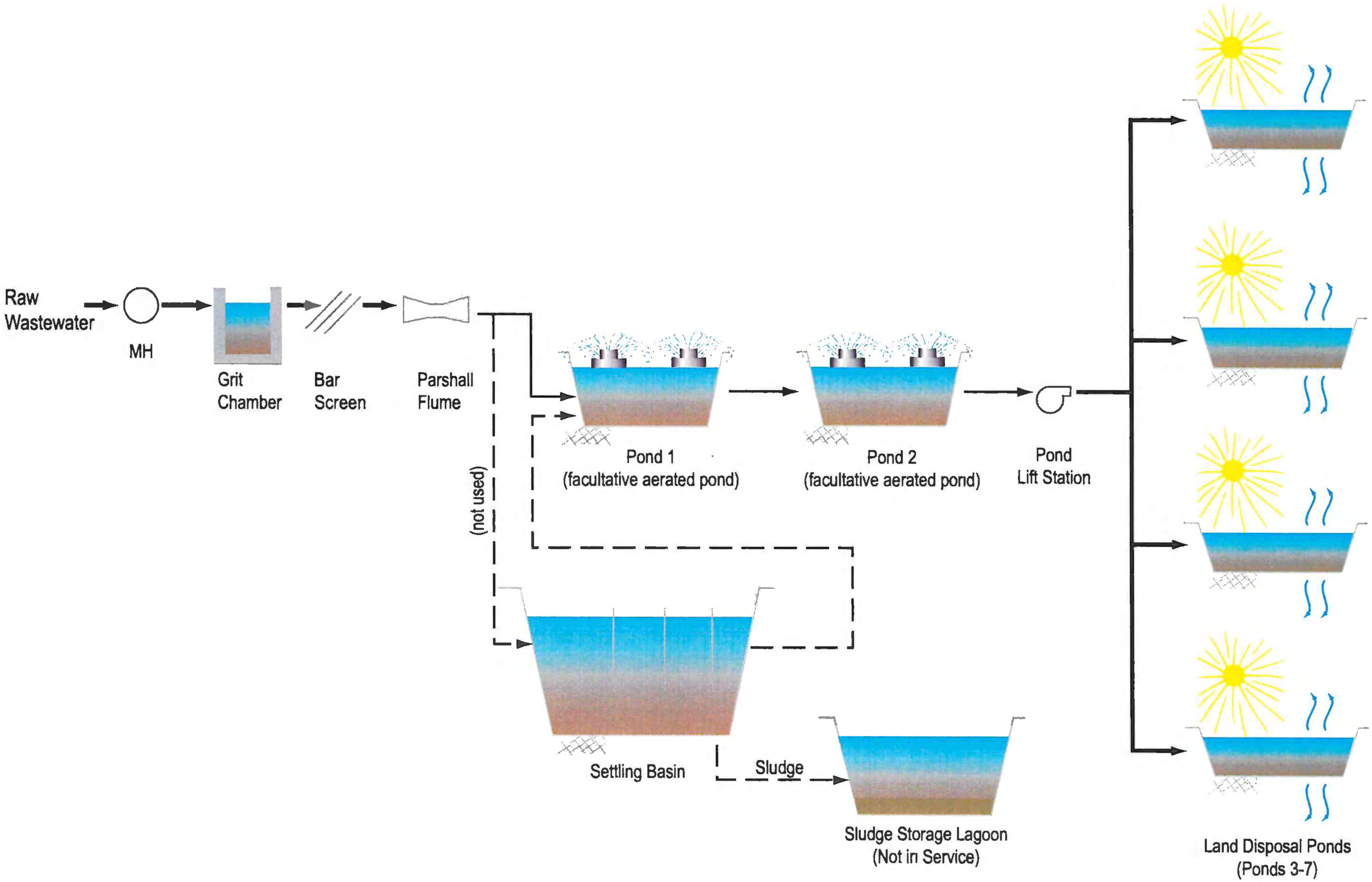


HydroScience Engineers, Inc.

Figure 3-3
City of Hollister Long-Term Wastewater Management Program
Existing IWTP Process Flow Diagram

Table 3-1: IWTP Unit Process Design Criteria [a]

Design Criteria	Design Data	
Raw wastewater	Canning season	Non-canning season
ADF (monthly average)	6.10 MGD	2.60 MGD
BOD	1,200 mg/L	350 mg/L
TSS	Not available	350 mg/L
Headworks		
Grinder		
Type	Mechanical grinder	
Number	1	
Capacity	6.0 MGD	
Bar screen		
Type	Overflow 4-inch bar screen	
Number	1	
Capacity	6.5 MGD	
Influent flow measurement		
Type	Parshall flume	
Number	1	
Size	12-inch	
Facultative aerated ponds (Pond 1A, 1B)		
Total surface area	12 acres	
Depth (Pond 1A, 1B)	26 ft and 24.5 ft	
Total aeration hp	1,575 hp	
Number of aerators	20	
Facultative aerated pond (Pond 2)		
Total surface area	9 acres	
Depth	10 ft	
Total aeration hp	100 hp	
Number of aerators	5	
Secondary Pond Lift Station		
Number of pumps	2	
Capacity (each)	8.64 MGD	
Hp (each)	20 hp	
Percolation beds		
Number	4	
Surface area	36.1 acres	

[a] Abstracted from the City ROWD, November 8, 1998.

Table 3-2: Summary of Major Unit Process Capacities at the IWTP (MGD)

Process	Flow criteria	1998 [a, e]
Headworks	PWWF [b]	6.0
Sedimentation Ponds	ADF [c]	Not in Use
Sludge Stabilization Basin	ADF [c]	Not in Use
Ponds 1, 2 canning season	ADF [c]	6.10
Ponds 1, 2 non-canning season	ADF [c]	9.70
Pond 2 lift station, per pump	PWWF [b]	8.64
Discharge Ponds	AWWF [d]	2.60–5.20

[a] After IWTP upgrades.
[b] NPDES.
[c] Average dry weather flow.
[d] AWWF.
[e] Abstracted from the City ROWD, November 8, 1998.

3.3. Wastewater Effluent Management

Effluent from the IWTP is discharged in a series of percolation beds located along the northwest section of the plant for a combined monthly discharge capacity of 2.60 to 5.36 MGD of discharge capacity, depending on the operational mode. The percolation rate was estimated to be 0.45 ft per day in the canning season and 0.29 ft per day during the non-canning season. Based on these percolation rates, the capacity of the IWTP during the canning season was estimated in the 1998 IWTP ROWD at 4.10 to 5.36 MGD for limited periods of time. This assumes that the percolation beds are operated using long flooding/drying cycles where the beds are flooded during the canning season and allowed to recover during the off-season. In contrast, a sustained discharge capacity of 2.60 MGD can be achieved using relatively short flooding/drying cycles. This operational mode is representative of current IWTP operations where year-round operation has been required to treat and discharge diverted domestic wastewater.

3.4. Current Plant Operations

Operations at the IWTP were evaluated in terms of treatment and discharge capacity. Potential deficiencies in each area are discussed below pursuant to the prevailing WDR Order 00-020 **(Appendix A)**.

3.4.1. Treatment

In the absence of any new industrial customer requiring IWTP service and potentially altering influent water quality, there appears to be adequate treatment capacity to handle current wastewater flows. This includes wastewater from the current industrial wastewater discharger and diverted domestic wastewater.

Permit limits became more stringent as of May 1, 2002. Consequently, the City has reported exceedances of discharge limitations at the IWTP. Specifically, the City has reported to the RWQCB that effluent limits for TDS, sodium, and chloride limits have been exceeded. Removal of dissolved solids from treated wastewater is difficult. Treatment processes for dissolved solids removal would typically include advanced processes such as reverse osmosis, ion exchange, or electrodialysis. These processes are typical prohibitively expensive. In addition, removal of TDS by these methods results in a waste brine that requires disposal. An alternative to treating wastewater for dissolved solids removal is source control in the wastewater stream.

The City has been working with San Benito Foods to develop a strategy for reducing TDS levels in the wastewater. In March 2003, the City evaluated the ability of the IWTP to control effluent TDS at the processing source. The results from that study concluded that there is reasonable potential that the IWTP can comply with TDS discharge requirements if source control measures proposed by San Benito Foods, the sole industrial discharger, are implemented and at least a net 25% reduction in raw industrial wastewater TDS is achieved (HydroScience Engineers, 2003b). San Benito Foods however, has continued to discharge water with high levels of TDS, sodium and chloride that exceed IWTP discharge criteria.

3.4.2. Disposal

Evaluation of the IWTP treatment and discharge system does not indicate a deficiency in disposal capacity in the percolation beds based on the current industrial and diverted domestic wastewater flows. A March 1983 study by San Benito Engineering & Surveying concluded that disposal capacity is the limiting factor at the IWTP. They further estimated that the capacity for storage plus discharge was 7.5 MGD, based on canning season operation, measured percolation rates, and on past observations of flow and pond levels. Current influent flows are significantly less than the estimated disposal capacity. Unless unforeseen industrial customers come online, influent flows to the IWTP will decrease once the City actually implements the LTWMP and stops diverting domestic wastewater to the IWTP.

3.4.3. LTWMP Impacts

Evaluation of the IWTP indicates adequate treatment and disposal capacity to treat current industrial and diverted domestic wastewater. The industrial customer is implementing ongoing source control at the industrial source to mitigate high TDS in the raw industrial wastewater. At the time of this report, there are no additional industrial wastewater customers under consideration for connecting to the IWTP. Adequate disposal capacity currently exists for industrial flow and with the anticipated construction of LTWMP improvements to the DWTP, diversion of domestic wastewater to the IWTP is expected to cease. Once this occurs, additional disposal capacity at the IWTP will be available either for seasonal or year-round discharge.

Primary emphasis for improving effluent quality at the IWTP is source control at San Benito Foods and the implementation of a Wastewater/Storm water Separation Project. The sole discharger to the IWTP in the immediate future would appear to continue to be San Benito Foods. The long-term discharge from San Benito Foods is therefore dependent upon the company's continued operation. The ability of the IWTP to meet future anticipated effluent limitations needs to be reviewed. Further improvements at or modifications to the IWTP can be addressed once the results of these actions have been assessed.

The City considered consolidating treatment of both domestic and industrial wastewater into one new WWTP. However, adding capacity at a new DWTP for a seasonal industrial flow would add significant costs. These costs would be difficult to justify or pass on to San Benito Foods or other members of the community. The City proposes to continue treating industrial wastewater at the IWTP and has not included capacity for the industrial flow in the new DWTP. If necessary, the City could consider adding industrial wastewater treatment capacity as a future upgrade to the new DWTP.

SECTION 4

Wastewater Flows

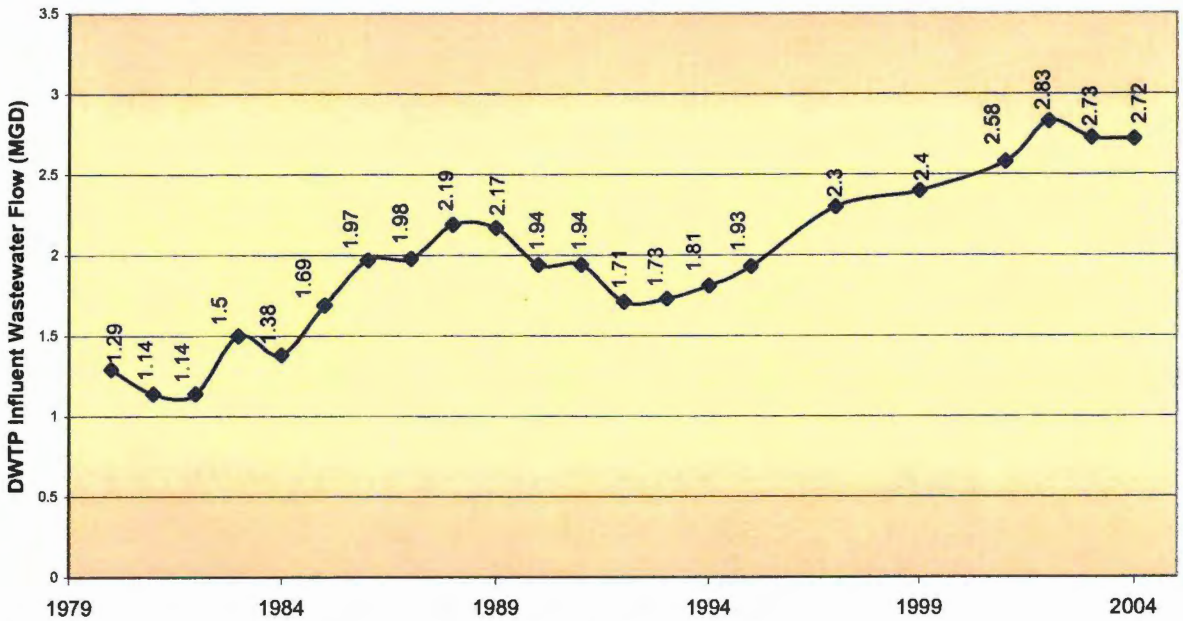
4. Wastewater Flows

This Section discusses current and historical wastewater flows at the DWTP and the IWTP. It also presents projected domestic wastewater flows and quantifies constituents measured at the influent of the DWTP.

4.1. Domestic Wastewater

The DWTP was originally constructed in 1979 and became operational in 1980. Historical average daily influent flows to the DWTP from 1980 through 2004 are shown in **Figure 4-1**.

Figure 4-1: Historical Average Annual DWTP Influent Flow



4.1.1. Current Domestic Wastewater Flows

Over time, the capacity of the DWTP's percolation beds appear to have diminished. Consequently, in the late 1990's the City explored emergency diversion of domestic wastewater for treatment and disposal at the IWTP, which had surplus treatment and disposal capacity available. At the time of this diversion request the IWTP operated under a WDR, which allowed up to 7.5 MGD of cannery waste on a seasonal basis. With only one cannery in operation industrial waste flows were less than 3.5 MGD. Surplus treatment capacity is therefore available at the IWTP on a seasonal basis.

In November 1998, the City requested approval from the RWQCB to divert domestic wastewater flow to the IWTP. This request was predicated on having surplus treatment and disposal capacity at the IWTP. The RWQCB granted the City's request and subsequently adopted Order 00-020 (**Appendix A**) on May 20, 2000, allowing temporary diversion of domestic wastewater to the IWTP. The diversion of domestic wastewater to the IWTP was permitted on a temporary basis until adequate treatment and disposal capacity could be developed at the DWTP. On October 21, 2005 the RWQCB adopted Order No. R3-2005-0142 extending the period of time in which the City could divert domestic wastewater to the IWTP to December 31, 2007. The chronology of events and specific diversion allowances are described in detail in **Section 1**.

San Benito Foods is the only current contributor of industrial wastewater to the IWTP. All other wastewater flow to the IWTP enters via the storm water collection system. **Table 4-1** summarizes domestic and industrial wastewater flows for the City of Hollister in 2004. *The average annual domestic wastewater flow for the City of Hollister for the year 2004 was 2.72 MGD.* This table summarizes total domestic wastewater flow measured at the DWTP plus domestic wastewater diversions to the IWTP as measured at the City's transfer pump station. Because industrial and domestic wastewater flows are combined at the IWTP, industrial flows were calculated by subtracting domestic wastewater diversions measured at the transfer pump station from total influent flow measured at the IWTP headworks.

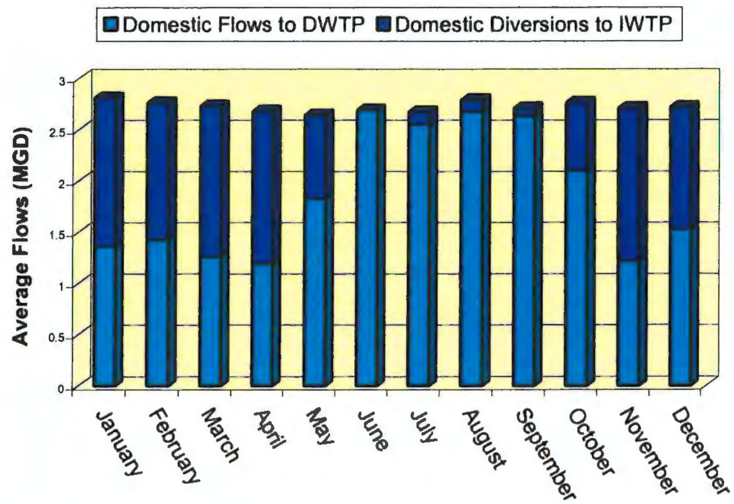
Table 4-1: Current Wastewater Flows in the City of Hollister

	Average Monthly Wastewater Flows (MGD) in 2004				
Month	**Domestic Flows to DWTP[a]**	**Domestic Diversions to IWTP[b]**	**Estimated Domestic Flow[c]**	**Flows to IWTP[d]**	**Estimated Industrial Flow[e]**
January	1.36	1.45	2.81	1.50	0.05
February	1.42	1.34	2.76	1.55	0.21
March	1.26	1.47	2.73	1.48	0.01
April	1.19	1.49	2.68	1.47	- 0.02
May	1.82	0.82	2.64	0.86	0.04
June	2.69	0.00	2.69	0.06	0.06
July	2.55	0.12	2.67	2.64	2.52
August	2.67	0.12	2.79	3.45	3.33
September	2.63	0.08	2.71	1.47	1.39
October	2.10	0.66	2.76	0.77	0.11
November	1.22	1.49	2.71	1.51	0.02
December	1.53	1.19	2.72	1.36	0.17

[a] Flows measured at the DWTP headworks in 2004.
[b] Domestic wastewater flows diverted to the IWTP in 2004 as measured at the transfer pump station.
[c] Total estimated domestic wastewater flow calculated as domestic flow to the DWTP plus domestic flow diversions to the IWTP.
[d] Flows measured at the IWTP headworks in 2004.
[e] Industrial wastewater flow calculated as flow to the IWTP less the domestic flow from the transfer pump station.

Domestic wastewater flows in the City of Hollister averaged approximately 2.72 MGD in 2004 with little inflow and infiltration (I/I) observed. Industrial wastewater flows varied significantly over the year with peak flows occurring during the canning season months of July through October. The domestic wastewater flows sent to the IWTP plus the flows to the DWTP are shown in **Figure 4-2** by month for the year 2004.

Figure 4-2: Domestic Wastewater Average Monthly Flows in 2004



4.1.2. Projected Domestic Wastewater Flows

Future projected wastewater flows are based on projected population growth from the beginning of 2008. The current flow of 2.72 MGD is assumed for the year 2008 because flows are not expected to increase significantly in the interim because of the City's moratorium on new sewer connections until implementation of the LTWMP. Population growth projections and associated increases in wastewater flow are based upon the assumptions presented in the draft *City of Hollister General Plan, March 2005* (City of Hollister, 2005). Assumptions used in the generation of these wastewater flow projections include:

- 2.6% annual increase in residential development
- 2.9% annual increase in commercial development
- 2.6% annual increase in school development
- 2.67% weighted annual average increase in wastewater flow (General Plan Build-Out)
- 0.25 MGD flow at Ridgemark WWTP beginning in 2008 (Sunnyslope County Water District)
- 4.2% annual increase in wastewater flow from Ridgemark WWTP (San Benito County Water District, Schaaf & Wheeler, 1999).

Future Average Dry Weather Flow (ADWF) projections for the City of Hollister are shown in **Table 4-2.**

Table 4-2: Wastewater Flow Projections for the City of Hollister

Year	ADWF (MGD)			Year	ADWF (MGD)		
	Hollister[a]	SCWD[b]	Total		Hollister[a]	SCWD[b]	Total
2008	2.72	0.25	2.97	2016	3.36	0.35	3.71
2009	2.79	0.26	3.05	2017	3.45	0.36	3.81
2010	2.87	0.27	3.14	2018	3.54	0.38	3.92
2011	2.94	0.28	3.22	2019	3.63	0.39	4.02
2012	3.02	0.29	3.31	2020	3.73	0.41	4.14
2013	3.10	0.31	3.41	2021	3.83	0.43	4.26
2014	3.19	0.32	3.51	2022	3.93	0.44	4.37
2015	3.27	0.33	3.60	2023	4.04	0.46	4.50

[a]Hollister wastewater flows assumed to increase 2.67% per year (Weighted growth average, reference Hollister General Plan).
[b]Sunnyslope County Water District Service area wastewater flows assumed to increase 4.2% per year (San Benito County Planning Department).

The DWTP design flow must allow for seasonal increases in flow due to wet weather inflow and infiltration (I/I). Historical wet weather flows at the DWTP can exceed ADWF by as much as 10 percent. ***A design treatment capacity of 5.0 MGD was therefore selected for the DWTP to allow for 10 percent I/I.*** **Table 4-3** summarizes the design flows selected for the new DWTP.

Table 4-3: Summary of Design Wastewater Flow (MGD) for the DWTP[a]

Flow Condition	Average Dry Weather Flow (ADWF)	Peak Wet Weather Flow (PWWF)[b]	DWTP Design Capacity[c]	Peak Hourly Flow[d]
Design (2023)	4.5	5.0	5.0	10.0

[a]Rounded to the nearest 0.1 MGD.
[b]Assumed to be ADWF plus 10 percent I/I.
[c]DWTP design capacity=PWWF.
[d]Assumed to be 2.0 times the DWTP design capacity.

4.1.3. Domestic Wastewater Influent Characteristics

In January 2003, the City completed a preliminary NPDES sampling report to assess the feasibility of pursuing a surface water discharge to the San Benito River (HydroScience Engineers, 2003c). This study conducted sampling and analytical testing of ambient water quality conditions at the river as well as influent wastewater to the DWTP. The parameter list shown in **Table 4-4** was derived from the California Toxics Rule (CTR) priority pollutant list and is detailed in the NPDES Monitoring Requirements prepared by the Central Valley RWQCB. The study tested for constituents likely to be regulated by the RWQCB Basin Plan Objectives, CTR, and State Implementation Plan (SIP).

Table 4-4: Raw Wastewater Sampling CTR Parameter List

Parameter	EPA Analysis Method	Parameter	EPA Analysis Method
General Water Quality		**Semi-Volatile Organic Compounds**	
Ammonia	350.2	SVOC	8270
Nitrate as Nitrogen	300.0	Metals	
Nitrite as Nitrogen	300.0	13 metals	6020/7000
Fluoride	300.0	Arsenic, lead, mercury	1631
Total Kjeldahl Nitrogen (TKN)	SM 4500	Chromium VI	7199
Phosphorus (Total)	365.2	**Organics**	
TDS	160.1	Pesticides and PCBs	8081A/8082
TSS	160.2	OP pesticides	8141A
Hardness	SM 2340	Herbicides	8151

Parameter	EPA Analysis Method	Parameter	EPA Analysis Method
Sodium	3050/6020	Dioxins	8290
Volatile Organics		**Conventional**	
VOC	8260	Cyanide	335.2
		Asbestos	600/R

The results of the January 2003 sampling of the raw wastewater are shown in **Table 4-5**. Based on the preliminary NPDES sampling report, water quality analysis in the influent wastewater did not result in significant concentrations of constituents that would preclude an NPDES permit. Measured concentrations of these parameters in the influent wastewater, compared to ambient river concentrations, were either below regulated concentrations or could be mitigated to levels that would achieve compliance with State and Federal limits. In addition to the constituents below, it is likely that discharge conditions would also require compliance with the maximum contaminant levels (MCLs) listed in **Section 5.**

Table 4-5: Raw Wastewater Detectable Results Summary

General Water Quality Parameters			
Ammonia as Nitrogen	38 mg/L	pH	7.41 pH units
Chloride	860 mg/L	Phosphorus, Total	5.8 mg/L
Hardness, as $CaCO_2$	460 mg/L	Sulfate (SO_4^{2-})	170 mg/L
Nitrate, as Nitrogen	1.50 mg/L	Sulfide, as S	1.20 mg/L
Nitrite, as Nitrogen	0.5 mg/L	TDS	2,000 mg/L
Volatile Organic Compounds			
1,1,2,2-Tetrachloroethane	<1 microgram (μg)/L	Chloroform	2.10 μg/L
1,4-Dichlorobenzene	27 μg/L	Dibromochloromethane	2.70 μg/L
Acrolein	<5 μg/L	Dichlorobromomethane	0.69 μg/L
Bromoform	4.10 μg/L	Dichloromethane	<1 μg/L
Semi-Volatile Organic Compounds			
Bis(2-ethylhexyl)phthalate	19.0 μg/L	Di-n-octylphthalate	ND
Butyl Benzyl phthalate	6.00 μg/L	Diethyl phthalate	7.00 μg/L
Metals			
Aluminum	850 μg/L	Iron	370 μg/L
Antimony	ND	Lead	<5 μg/L
Arsenic	1.70 μg/L	Mercury	0.092 μg/L
Barium	ND	Manganese	63.0 μg/L
Beryllium	ND	Nickel	7.40 μg/L
Cadmium	ND	Selenium	3.10 μg/L
Chromium, Total	9.50 μg/L	Silver	1.90 μg/L
Chromium, VI	ND	Thallium	ND
Copper	80.0 μg/L	Zinc	100 μg/L
Dioxins and Furans Congeners			
2,3,7,8-TCDD	<1.81 picogram(pg)/L	2,3,4,7,8-PentaCDF	<1.81 pg/L
1,2,3,7,8-PentaCDD	<4.22 pg/L	1,2,3,4,7,8-HexaCDF	<0.96 pg/L
1,2,3,4,7,8-HexaCDD	<2.79 pg/L	1,2,3,6,7,8-HexaCDF	<1.07 pg/L
1,2,3,6,7,8-HexaCDD	<3.24 pg/L	1,2,3,7,8,9-HexaCDF	<1.21 pg/L
1,2,3,7,8,9-HexaCDD	<2.96 pg/L	2,3,4,6,7,8-HexaCDF	<1.53 pg/L
1,2,3,4,6,7,8-HeptaCDD	63.2 pg/L	1,2,3,4,6,7,8-HeptaCDF	19.0 pg/L
OCDD	784 pg/L	1,2,3,4,7,8,9-HeptaCDF	<1.28 pg/L
2,3,7,8-TCDF	<1.65 pg/L	OCDF	94.30 pg/L
1,2,3,7,8-PentaCDF	<2.09 pg/L		

ND – Not Detected

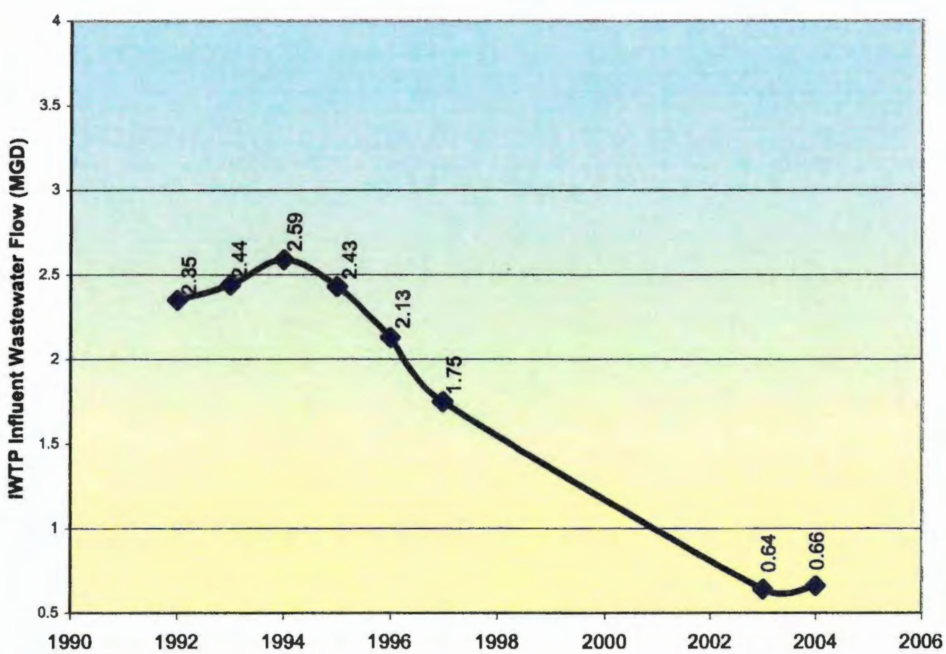
4.2. Industrial Wastewater

Historical, current, and projected buildout flows to the IWTP were evaluated to develop planning level wastewater flows used in the development of the LTWMP.

4.2.1. Industrial Wastewater Flows

Historical average influent flows to the IWTP from 1992 to 1997 are shown in **Table 4-3**. These flows represent industrial wastewater flows, prior to commencement of domestic diversions to the IWTP. After 1997 industrial flows could no longer be measured directly because they were co-mingled with diverted domestic wastewater. Data on domestic water diversions was needed to estimate industrial wastewater flows (See **Table 4-1**). Estimated industrial wastewater flows are available for 2003 and 2004. Industrial wastewater flows have decreased significantly over the last ten years.

Figure 4-3: Historical Average Annual Influent IWTP Flow



As described in **Section 1**, the RWQCB granted the City's request to divert domestic wastewater flow to the IWTP and adopted Order 00-020 on May 20, 2000, allowing temporary diversion of domestic wastewater to the IWTP. Estimated current domestic wastewater flows, including those diverted to the IWTP and the estimated industrial flows based on the total flows to the IWTP are presented in **Table 4-1**. Current flow to the IWTP is comprised of cannery flow, storm water flow, and diverted domestic wastewater flow. Cannery and storm water flows are seasonal. Domestic wastewater diversion occurs on a year-round basis.

Similar to the DWTP, I/I generally does not represent a significant fraction of the IWTP influent flow. Historically, the City has not detected significant infiltration as a result of groundwater presence. Inflow, however, can be a significant short-term problem, especially during heavy rainstorms when the plant can receive substantial storm water flow.

4.2.2. Projected Industrial Wastewater Flows

Industrial wastewater flow projections were not developed because any future growth in the areas of the City zoned for industrial developments would be treated at the DWTP. The IWTP is only designed to handle cannery flows so it is assumed that future IWTP flows would remain at or near current levels. At the time of this study, the City therefore does not anticipate a significant change in industrial wastewater flows in the future. The design flow for the IWTP is an ADF of 3.5 MGD. The implementation of a Wastewater/Storm Water Separation Project will not reduce total flows. It will only segregate flows for odor control purposes if it is implemented.

4.2.3. Industrial Wastewater Influent Constituents

The *2001 Annual Self Monitoring Report* and *Report to the RWQCB* (Bracewell Engineering, 2001), summarized in **Table 4-5,** was used to characterize the IWTP wastewater.

Table 4-6: IWTP Raw Industrial Wastewater Characteristics (mg/L)

Constituent	Canning Season	Non-Canning Season
BOD	1,200 [a]	210 [c]
TSS	NA [b]	350 [c]
TKN	NA [b]	35 [c]
TDS	1,800 [d]	1,400 [c]
SO_4^{2-}	NA [b]	270 [c]
Nitrate (NO_3^-)	NA [b]	7 [c]
Cl^-	170 [e]	360 [c]
Sodium	300 [d]	300 [c]

[a] Source: Bracewell Engineering, Inc., 2001.
[b] Not analyzed as part of the regular monitoring program.
[c] Based on 7 samples. Source: 2001 Annual Self Monitoring Report.
[d] Based on 3 samples. Source: 2001 Annual Self Monitoring Report.
[e] Based on 2 samples. Source: 2001 Annual Self Monitoring Report.

Mass loadings of conventional pollutants are summarized in **Table 4-7** for the LTWMP and build-out conditions during the canning season.

Table 4-7: IWTP Raw Industrial Wastewater Loading for the LTWMP

Constituent	Average Concentration (mg/L)	Mass Loading [Pounds Per Day (lbs/Day)] [a, b]
BOD	1,200	35,100
TSS	NA	NA [c]
TKN	NA	NA [c]
TDS	1,800	52,600
SO_4^{2-}	NA	NA [c]
NO_3^-	NA	NA [c]
Cl^-	170	5,000
Sodium	300	8,800

[a] Based on ADF.
[b] Rounded off to the nearest hundredth.
[c] Not analyzed.

SECTION 5

Regulatory Requirements

5. Regulatory Requirements

Regulatory requirements would vary depending on the method of discharge. It is possible that more than one method of discharge would be required to meet project disposal requirements. As a result, different effluent and discharge standards may apply according to the disposal method selected. In turn, these discharge standards would drive the level and type of treatment required.

This Section discusses likely regulatory restrictions for discharge of treated wastewater to land, to surface water, and for reuse. This Section includes a general discussion on the regulatory structure of the existing DWTP and IWTP discharge permits. Possible discharge requirements for each of the candidate discharge strategies are reviewed as they potentially pertain to the LTWMP.

5.1. Existing Discharge Permits

The DWTP and the IWTP are currently permitted by the RWQCB through WDR permits. These permits would have to be amended when the LTWTP is implemented because it is anticipated that there will be significant modifications in wastewater treatment and disposal strategies.

5.1.1. Nitrogen Limits

Comments received from the RWQCB (November 14, 2002) suggest that any new WWTP would have to comply with the most stringent nitrogen limits as established in the local groundwater basin plan for any form of disposal. This suggestion was clarified in a subsequent letter from the RWQCB dated January 28, 2003. It is included in **Appendix F** and is summarized below.

Table 5-1: Expected Nitrogen Discharge Limits

Type of Discharge	Estimate of Expected Nitrogen Discharge Limits
Surface Water	0.22 to 0.9 mg/L
Percolation Bed	5 mg/L
Agricultural Irrigation	Will depend upon the manner in which irrigation takes place. • Probably higher if users were required to incorporate Nitrogen concentrations in recycled wastewater when calculating fertilizer application rates. • If irrigation water subsequently discharges to surface water as irrigation tail water, surface water discharge limitations may be applicable. • If Nitrogen concentrations in irrigation water are expected to impact groundwater, then groundwater discharge limitations may be applicable.

5.1.2. Domestic Wastewater Treatment Plant

Currently, percolation beds are used to discharge all DWTP effluent. Discharge of effluent at the DWTP percolation beds is authorized and regulated by WDR Order No. 87-47, issued by the Central Coast RWQCB in March 1987 **(Appendix E),** following a plant expansion that increased the plant's capacity to 2.69 MGD ADF. The WDR has not been revised since 1987 because there have not been any major plant expansions or modifications – except for construction of the new headworks and the DPMC modifications. These improvements were required to satisfy provisions of the Cease and Desist Order R3-2002-0105 (**Appendix B**).

The existing WDR for the DWTP sets limits on flow and includes a few numeric limits for dissolved oxygen (DO) in the surface zone of the ponds and effluent pH. There are no numeric limits set for any other parameters, including BOD, TSS, TDS, nitrate, boron, chlorides, sodium, and/or metals. There are however discharge prohibitions and groundwater impact limitations related to some of the aforementioned parameters. The following is a summary of the existing effluent prohibitions and specifications abstracted from WDR Order No. 87-47:

- Discharge of any wastes, including overflow, bypass, seepage, and over spray, to the San Benito River, adjacent drainages, and adjacent property is prohibited.
- DO in the surface zone of the ponds shall be at least 2.0 mg/L.
- Effluent pH shall be between 6.5 and 8.4.
- Discharge of less than primary-treated effluent to the percolation beds is prohibited except during maintenance.
- 30-day ADF through the DWTP cannot exceed 2.69 MGD.
- Percolation beds must be operated on a 7-day cycle - 6 days of water application and 1 day of drying.
- The discharge cannot cause the nitrate concentration in the groundwater down-gradient of the discharge area to exceed 5 mg/L or background levels, whichever is lower.
- The discharge cannot cause a statistically significant increase in mineral constituent concentrations in underlying groundwaters.
- The discharge cannot cause concentrations of chemicals and radionuclides in groundwater to exceed statutory limits.

Over time, the capacity of the DWTP's percolation beds diminished to the point where the ability of the DWTP to adequately and reliably handle domestic wastewater flows became compromised. Consequently, the City explored emergency diversion of domestic wastewater for treatment and discharge at the IWTP, which had available treatment and discharge capacity. In November 1998, the City requested approval to divert domestic wastewater flow to the IWTP. The RWQCB granted the City's request and subsequently adopted Order 00-020 revising WDR requirements for the IWTP in May 20, 2000, allowing temporary diversion of domestic wastewater to the IWTP. A copy of Order 00-020 is included as **Appendix A.** Some conditions of the order are listed below:

- Domestic wastewater can be diverted only on a temporary basis until additional capacity could be added to the DWTP.
- Further discharge or diversion of domestic wastewater to the IWTP is prohibited after June 30, 2005 (subsequently revised to December 31, 2007).
- A five-year time schedule for development and implementation of the LTWMP is required.
- By May 20, 2002, the City was required to submit a fully developed LTWMP to RWQCB outlining how that implementation schedule was to be met.
- The City is required to fully implement the LTWMP by May 20, 2005 (first revised to October 15, 2005 and subsequently revised to December 31, 2007).

The extent of the diversion capacity is summarized in **Table 1-1.**

During mid-2001 and early 2002, discharges at the IWTP and DWTP resulted in a violation of each facility's WDRs. From June 1, 2001, to March 31, 2002, it is estimated that 6,100 gallons of treated undisinfected wastewater seeped into the inactive San Benito River channel from Percolation Bed 13 of the DWTP. On May 6, 2002, the levee of IWTP Pond 6 was breached, discharging an estimated 15 MG of treated undisinfected domestic wastewater to the San Benito River channel. In addition, the RWQCB staff became concerned that plant influent flow measurements may not have been accurate. The RWQCB issued Cease and Desist Order No. R3-2002-0105, included in **Appendix B,** on October 17, 2002, listing interim milestones for achieving compliance, including:

- By November 2002 (subsequently revised to March 3, 2003), the City must award a contract for construction and installation of equipment to reduce TSS concentrations in treated effluents discharged to the percolation beds of the DWTP.
- By July 2003 (subsequently revised to August 1, 2003), the City must complete construction and initiate use of new treatment plant headworks at the DWTP to accurately measure influent flow volumes and ensure prevention of the emission of nuisance odors at the headworks.

5.1.3. Industrial Wastewater Treatment Plant

Currently, percolation beds are used to discharge all IWTP effluent. Discharge of effluent at the IWTP percolation beds is authorized and regulated by WDR Order 90-90, issued by the Central Coast RWQCB in July 1990 **(Appendix D)**. This WDR was later revised by WDR Order 00-020 **(Appendix A)**, to accommodate the City's request to divert domestic wastewater flows and utilize available treatment and discharge capacity at the IWTP. Temporary diversions from the DWTP were granted to provide enough time for the City to implement the LTWMP and must cease by June 30, 2005 (subsequently revised to December 31, 2007).

WDR Order 90-90, and later WDR Order 00-020, set limits on flow and includes a few numeric limits for salinity control and effluent pH. There are no numeric limits for any other parameters, including BOD, TSS, nitrate, boron, and/or metals. There are, however, discharge prohibitions and groundwater impact limitations related to some of the aforementioned parameters. The following is a summary of the existing effluent prohibitions and specifications abstracted from WDR Order 00-020:

- Average day monthly cannery wastewater flows shall not exceed 3.5 MGD during canning season (mid-June through mid-October) and 0 MGD during non-canning season.
- Average day monthly domestic wastewater flows shall not exceed 1.52 MGD during non-canning season, and phased during canning season.
- 30-day average settleable solids shall be less than 2.5 mg/L.
- Annual average TDS shall be less than 1,415 mg/L.
- Annual average sodium shall be less than 250 mg/L.
- Annual average chloride shall be less than 240 mg/L.
- DO in the aerated and discharge ponds shall not fall below 2.0 mg/L and 1.0 mg/L, respectively, at any time.
- Effluent pH shall be between 6.5 and 8.4.
- The discharge shall not cause a statistically significant increase in mineral constituent concentrations in underlying groundwaters.
- The discharge shall not cause nitrate concentrations (as Nitrogen) in the groundwater down gradient of the discharge area to exceed 5 mg/L.

5.2. Discharge to Land

Land discharge of wastewater includes percolation and spray field irrigation. Principal factors affecting effluent limitations for land discharge are the nature of soils and groundwaters in the discharge areas and, where irrigation is involved, the nature of crops. Wastewater characteristics of particular concern are total salt content, nitrate, boron, pathogenic organisms, and toxic chemicals. Where percolation alone is considered, the nature of underlying groundwaters is of particular concern.

Nitrate removal is required in many cases where percolation is to beneficial groundwater basins. Percolation basins operated in alternating wet and dry cycles can provide significant nitrogen removal through nitrification/denitrification processes in the soil column. Finer textured soils are more effective than coarse soils.

Vegetative uptake will utilize soluble nitrates, which would otherwise move into groundwater under a percolation operation. Demineralization techniques or source control of TDS may be necessary in some areas where groundwaters have been or may be degraded. Use of effluent for crop irrigation may be rejected based on excessive salinity, boron, or sodium.

According to the Central Coast RWQCB Basin Plan, "land discharge of wastewaters in the Hollister region must be monitored carefully to assure groundwater quality is protected. Source control of salt must be stressed to reduce effluent salinity to levels acceptable for discharge to local groundwaters."

5.2.1. Discharge by Percolation

Discharge requirements for percolation generally require a secondary level of treatment with potential controls on nitrogen, specifically nitrate, for groundwater protection. Possible WDR conditions for subsurface discharge would be based on beneficial use designations outlined in the Basin Plan for this groundwater basin. The DWTP lies at the boundary between the San Juan Valley sub-basin and the Hollister West sub-basin of the Gilroy Hollister Groundwater Basin. Beneficial uses for this groundwater basin include municipal and domestic water supply, agricultural water supply, and industrial water supply. Generally, regulation to meet domestic and agricultural supplies is sufficient, as industrial requirements vary dramatically. In addition, any water quality objectives set in the Basin Plan must be considered in determining effluent limits.

Subsurface dischargers are required to submit a Report of Waste Discharge (ROWD) to the RWQCB prior to any major modifications to a treatment process or capacity. Upon receipt of the ROWD, the RWQCB will revise and reissue the subject WDR. The RWQCB is required to consider all applicable regulatory requirements in setting new effluent standards in the revised WDR. As a result, the City can expect that a new WDR for discharge through infiltration will incorporate any new requirements set forth in the 1994 Basin Plan related to protection of groundwater quality.

Determination of discharge limits is evaluated by the RWQCB on a case-by-case basis and is not developed until a ROWD has been submitted. However, by reviewing recently drafted permits for similar basins, inferences can be made on possible discharge requirements. Recently, the Central Coast RWQCB drafted a revised WDR for the South County Regional Wastewater Authority (SCRWA), which treats effluent from the Cities of Gilroy and Morgan Hill. The draft was requested by the discharger to re-rate the capacity of the WWTP, which is a conventional secondary-level WWTP that uses percolation beds for discharge.

Since the beneficial use designations are similar, the effluent limitations in the draft WDR for the SCRWA can be reviewed as an example of the City's potential future effluent limits for discharge to percolation beds. Potential effluent limits for these water quality objective parameters have been adjusted in **Table 5-2** and **Table 5-3** to match anticipated water quality objectives for the Hollister area.

In addition, some effluent limits were established in the revised WDR for the IWTP. As a result, these limits may be reviewed as an indicator of likely standards in a revised WDR for the DWTP. Possible effluent limits for BOD, TSS, and nitrate (as Nitrogen) are summarized in **Table 5-2,** based on the SCRWA's draft WDR. Note that secondary treatment standards do not generally apply to land discharge in percolation beds; however, TSS and BOD removal can be required to protect beneficial use designations. These requirements were included in the draft SCRWA permit. Also, the nitrate limit of 5 mg/L corresponds to the expected nitrate limit in the RWQCB letter in **Appendix F**.

Table 5-2: Possible Effluent Limits for Percolation Beds Based on Draft WDR for SCRWA[a]

Constituent	Units	Daily Max	30-Day Mean	7-Day Mean
TSS	mg/L	—	30	45
BOD	mg/L	—	30	45
Nitrate	mg/L	5[b]	5	—

[a] WDR No. R3-2004-0099 NPDES No. CA0049964 WDID No. 3430100001 proposed for consideration at September 10, 2004 RWQCB meeting.
[b] This limit is based on a letter from the RWQCB, dated January 28, 2003 (Appendix F).

In addition to the draft SCRWA WDR, the IWTP WDR can also be used as a reference for likely effluent limitations to DWTP percolation beds. Possible effluent limitations based on water quality objectives and limitations included in the WDR for the IWTP are shown in **Table 5-3.** This includes limits for TDS, sodium, chloride, sulfate, and boron.

Table 5-3: Possible Effluent Limits for Percolation Beds Based on WDR for the IWTP[a]

Constituent	Units	12-Month Moving Average
TDS	mg/L	1,400
Sodium	mg/L	250
Chloride	mg/L	240
Sulfate	mg/L	250
Boron	mg/L	0.75-3.75

[a]WDR No. 90-90 (Appendix D).

5.2.2. Spray Field Discharge

Potential discharge requirements for land discharge by spray field generally require a minimum of secondary level of treatment. Unlike the discharge requirements for discharge by percolation, nitrogen limits might be less stringent, as indicated in **Table 5-1**. Potential impacts to the underlying groundwater by nitrified effluent could be mitigated by irrigating at crop-specific agronomic rates to avoid leaching nitrate into the groundwater. Possible WDR conditions for overland discharge of treated wastewater would be based on protection of the groundwater as outlined in the Basin Plan groundwater objectives for the Hollister sub-area in the Pajaro River sub-basin and California Code of Regulations (CCR) Title 22.

The Central Coast RWQCB has not adopted a specific Order outlining the requirements for discharge of treated wastewater over land. For the purpose of this evaluation, inferences are made from similar Orders in other RWQCB regions. Specifically, the San Francisco Bay RWQCB adopted Order 96-011, prescribing general water reuse requirements for municipal wastewater and water agencies.

This Order applies specifically to wastewater agencies that apply wastewater to land through irrigation for the primary purpose of discharge. It is distinguished from Title 22, which specifies statewide criteria for *use* of recycled water; Order 96-011 instead mandates criteria for *discharge* of wastewater to land, which may pose an identical degree of public exposure and risk. Possible WDR conditions based on the San Francisco Bay RWQCB Order 96-011 include:

- The treatment, storage, distribution, or reuse of recycled water shall not create a nuisance as defined in Section 13050(m) of the California Water Code.

- No recycled water shall be applied to irrigation areas during periods when soils are saturated.
- Recycled water shall not be allowed to escape from the designated use area(s) as surface flow that would either pond and/or enter waters of the state. Recycled secondary treated water shall not be allowed to escape from the designated use area(s) as an airborne spray that would visibly wet vegetation or any other surface.
- Spray or runoff shall not enter a dwelling or food handling facility, and shall not contact any drinking water fountain, unless specifically protected with a shielding device. If the recycled water is of restricted quality, then spray or runoff shall not enter any place where the public may be present during irrigation.
- Secondary recycled water shall not be applied so as to cause runoff or degradation of any water body or wetland.
- Recycled water shall not be applied in groundwater recharge and wellhead protection areas (so designated by local agencies).
- The use of recycled water shall not cause rising groundwater discharging to surface waters to impair surface water quality objectives or beneficial uses.
- The incidental discharge of recycled water to waters of the State shall not unreasonably affect present and anticipated beneficial uses of water, and not result in water quality less than that prescribed in water quality control plans or policies.
- No recycled water shall be discharged from treatment facilities, irrigation holding tanks, storage ponds, or other containment, other than for permitted reuse in accordance with this Order, other Board issued Waste Discharge Requirements (WDRs) or NPDES permits, contingency plan in an approved Water Reuse Program Notice of Intent (NOI) report, or for discharge to a municipal sewage treatment system.
- Recycled water shall not be used as a domestic or animal water supply.
- There shall be no cross-connection between potable water supply and piping containing recycled water. All users of recycled water shall provide for appropriate backflow protection for potable water supplies as specified in Title 17, Section 7604 of the CCR or as specified by DHS.

In general, there are limited water quality requirements for spray field discharge. Potential constituent limits for DO, sulfide, and coliform, as prescribed by Order 96-011, are summarized in **Table 5-4.**

Table 5-4: Possible Effluent Limits for Spray Fields[a]

Constituent	Units	Limit
Dissolved oxygen	mg/L	1.0
Dissolved sulfide	mg/L	0.1
Total coliform	Most probable number (MPN) per 100-mL	23 (7d median) [b] 240 (30d period) [b]

[a] San Francisco Bay RWQCB Order 96-011
[b] Limit for Secondary-23 Recycled Water (restricted use).

Based on CCR Title 22, effluent quality would, at a minimum, require disinfected secondary-23 recycled water. This requires effluent that has been oxidized and disinfected so that the median concentration of total coliform bacteria in the disinfected effluent does not exceed values indicated in **Table 5-4**.

In terms of the Central Coast Basin Plan, potential spray field sites located within the Hollister sub-area would have to meet groundwater objectives for the Pajaro River sub-basin as summarized in **Table 5-5.**

Table 5-5: Possible Effluent Limits for Spray Fields Based on Basin Plan

Constituent	Units	Median values
TDS	mg/L	1,200[a]
Sodium	mg/L	200
Chloride	mg/L	150
Nitrate (as Nitrogen)	mg/L	5

[a] The City, San Benito County, and San Benito County Water District signed a Memorandum of Understanding (MOU) in December 2004 establishing a recycled water target TDS limit of 500 mg/L and establishing a maximum limit of 700 mg/L. The target year for implementing these TDS limits is 2015.

Numeric Limits for Groundwater Affected by Land Discharge

In addition to effluent limits, the WDR will likely include numeric limits relating to impacts to groundwater quality for several parameters. This includes prohibitions against impacts related to nitrate, coliform, taste, mineral constituents, organic constituents, and radionuclides as they pertain to municipal and domestic water supply. The WDR may also include limits to groundwater impacts for several metals to protect the agricultural irrigation use designation, as summarized in **Table 5-6.**

Table 5-6: Possible Metals Concentration Limits for Land Discharge

Constituent	12-Month Moving Average	Constituent	12-Month Moving Average
Aluminum	5.0 mg/L	Lithium	2.5 mg/L
Arsenic	0.1 mg/L	Manganese	0.2 mg/L
Beryllium	0.1 mg/L	Mercury	0.01 mg/L
Cadmium	0.01 mg/L	Molybdenum	0.01 mg/L
Chromium	0.10 mg/L	Nickel	0.2 mg/L
Cobalt	0.05 mg/L	Nitrite	10 mg/L
Copper	0.2 mg/L	Selenium	0.02 mg/L
Fluoride	1.0 mg/L	Vanadium	0.10 mg/L
Iron	5.0 mg/L	Zinc	2.0 mg/L
Lead	0.1 mg/L		

5.3. Discharge to Surface Water

Principal factors affecting effluent limitations for surface water discharge are the beneficial use objectives for the specific receiving body. In setting WDRs, the RWQCB will consider the potential impact on beneficial uses within the area of influence of the discharge, the existing quality of receiving waters, and the appropriate water quality objectives. Depending on the present and potential beneficial uses, greater effluent restriction may be required for discharge to a receiving surface water body. For instance, a surface water body identified as a municipal and domestic supply would require a greater degree of protection than one identified solely for agricultural supply.

Surface water discharge will require the City to obtain a National Pollution Discharge Elimination System (NPDES) permit. This permit will require compliance with effluent discharge criteria based upon the CTR, National Toxics Rule (NTR), and local Basin Plan Water Quality Objectives. On March 2, 2000, the State Water Resources Control Board (SWRCB) adopted the Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California, also known as the State Implementation Policy (SIP). The SIP established methods of evaluating receiving water criteria and developing effluent limitation in NPDES permits for the priority pollutants contained in the United States Environmental Protection Agency (USEPA) NTR.

The RWQCB is required to protect and enhance the beneficial uses of surface and ground waters in the region. As part of that effort, NPDES permits are adopted prescribing effluent limits for the types and concentrations of chemical and physical constituents that can be safely discharged. To prepare appropriate NPDES permits, adequate characterization of the discharge effluent and the receiving waters are required.

Two types of surface water discharges are considered in this Section. The first is discharge to an inland surface water body, namely the San Benito River. For this receiving water body, the Basin Plan outlines general objectives for all inland surface waters plus specific requirements depending on the specific present and potential beneficial uses identified for the San Benito River. The second surface water discharge considered is to the Pacific Ocean via an ocean outfall. The following sections describe possible regulatory requirements for each receiving water body.

5.3.1. Discharge to the San Benito River

Potential discharge requirements for river discharge would most likely require tertiary level treatment. Existing language in the Basin Plan suggests surface water discharge for WWTPs to tributaries to the San Benito and Pajaro River is not recommended. Specifically, Chapter 4 of the Basin Plan Implementation recommends that the City retain the percolation beds. The same section further recommends that the City of San Juan Bautista, which currently discharges to a tributary to the Pajaro River, develop a land discharge system. Despite these recommendations, it should be noted that the Basin Plan does not specifically prohibit surface water discharges to these rivers.

At a minimum, tertiary-treated effluent would be required for discharge to the San Benito River based on inferences from draft permits for facilities discharging to similar water bodies. In 1998, a draft WDR/NPDES permit was prepared authorizing the SCRWA to discharge tertiary-treated effluent to the Pajaro River. The effluent limits set in the draft permit for SCRWA can be considered as an example of likely effluent limits for a surface water discharge from the City of Hollister to the San Benito River since the San Benito River is tributary to the Pajaro River.

Surface water discharges, like groundwater discharges, are subject to protection of beneficial use classifications, water quality objectives, and monitoring requirements. Since there are generally more beneficial use classifications for surface waters than groundwater, effluent limits are, in turn, generally more restrictive and include more constituents for surface water discharges. In addition, limits on other parameters must be set to comply with the CTR, as well as other CCR Title 22 pollutants. Furthermore, the SIP of the CTR includes significant increases in monitoring requirements.

Effluent sampling data for the San Luis Obispo NPDES permit application identified several priority toxic pollutants exceeding applicable SIP criteria resulting in a reasonable potential. These constituents include the three chlorine disinfection byproducts (DBPs) or trihalomethanes (THMs), chloroform, bromodichloromethane, and dibromochloromethane, and the plasticizer bis(2-ethylhexyl)phthalate. In some cases receiving water samples exceeded applicable criteria, resulting in a reasonable potential, thus requiring the establishment of effluent limitations. Constituents for which receiving water (Pajaro River) samples exceeded criteria include lead, thallium, aluminum and manganese. Aluminum and manganese are not priority toxic pollutants, however, they were evaluated as part of the reasonable potential analysis (RPA) as Basin Plan pollutants. Possible tertiary effluent limitations for a surface water discharge based on the WDR/NPDES permit for the SCRWA are shown in **Table 5-7**.

Table 5-7: Possible Effluent Limits for Surface Water Discharge to the San Benito River [a]

Parameter	Unit	Daily Max	30-Day Mean
BOD_5	mg/L	20	10
TSS	mg/L	20	10
Nitrate	mg/L	10	5

[a] Based on WDR No. R3-2004-0099 NPDES No. CA0049964 WDID No. 3430100001 proposed for consideration at September 10, 2004 RWQCB meeting.

Water quality objectives for the San Benito River are shown in **Table 5-8**. A surface water discharge permit would likely include a provision prohibiting discharge that could cause the San Benito River to exceed any of the objectives listed below.

Table 5-8: Water Quality Limits for the San Benito River [a]

Parameter	Units	Daily Average
TDS	mg/L	1,400
Chloride	mg/L	200
Sulfate	mg/L	350
Boron	mg/L	1
Sodium	mg/L	250

[a] Source: Central Coast Basin Plan.

In addition to the constituents above, it is likely that discharge conditions would require compliance with the MCLs indicated in **Table 5-9**. The MCLs are from the Basin Plan unless otherwise noted. Interestingly, compliance with these contaminant levels was required in the SCRWA permit for all of the effluent from the WWTP, including the secondary effluent discharged to the percolation beds. This is consistent with the Central Coast RWQCB's objective to protect the underlying groundwater basin. According to the Basin Plan, "When recharge of a useful groundwater basin occurs through stream channel recharge, impacts on groundwater quality must be considered."

Table 5-9: Maximum Contaminant Levels [a]

Organics	Primary MCL (mg/L)	Organics	Primary MCL (mg/L)
Alachlor (Alanex)	0.002 [c, d]	Heptachlor epoxide	0.00001 [b]
Atrazine (Aatrex)	0.003 [b]	Hexachlorobenzene	0.001 [c, d]
Bentazon (Basagran)	0.018 [b]	Hexachlorocyclopentadiene	0.05 [c, d]
Benzene	0.001 [b]	Lindane	0.004 [b], 0.0002 [c, d]
Benzo(a)pyrene	0.0002 [c, d]	Methoxychlor	0.03 [d]
Carbofuran (Furadan)	0.018 [b]	Methyl-tert-butyl ether (MTBE)	0.013 [d]
Carbon tetrachloride	0.0005 [b]	Molinate (Ordam)	0.02 [b]
Chlordane	0.0001 [b]	Monochlorobenzene[b] (Chlorobenzene)	0.030 [b]
2,4-D	0.1 [b], 0.07 [c, d]	Oxamyl	0.05 [d]
Dalapon	0.2 [c, d]	Pentachlorophenol	0.001 [c, d]
1,2-Dibromo-3-chloropropane (DBCP)	0.0002 [b]	Picloram	0.5 [c, d]
1,2-Dichlorobenzene (o-Dichlorobenzene)	0.6 [c, d]	Polychlorinated biphenyls (PCBs)	0.0005 [c, d]
1,4-Dichlorobenzene (p-DCB)	0.005 [b]	Simazine (Princep)	0.010 [b], 0.004 [c, d]
1,1-Dichloroethane (1,1-DCA)	0.005 [b]	Styrene (Vinylbenzene)	0.1 [c, d]
1,2-Dichloroethane (1,2-DCA)	0.0005 [b]	2,4,5-TP[b] (Silvex)	0.01 [b]
1,1-Dichloroethylene (1,1-DCE)	0.006 [b]	2,3,7,8-TCDD (Dioxin)	3×10^{-8} [c,d]
cis-1,2-Dichloroethylene	0.006 [b]	1,1,2,2-Tetrachloroethane	0.001 [b]
trans-1,2-Dichloroethylene	0.01 [b]	Tetrachloroethylene (PCE)	0.005 [b]
Dichloromethane (Methylene chloride)	0.005 [b]	Thiobencarb (Bolero)	0.07 [b], 0.001 [d]

Organics	Primary MCL (mg/L)	Organics	Primary MCL (mg/L)
1,2-Dichloropropane (Propylene dichloride)	0.005 [b]	Toluene (Methylbenzene)	0.15 [d]
Di(2-ethylhexyl)adipate	0.004[b]	Toxaphene	0.005 [b], 0.003 [c, d]
1,3-Dichloropropene	0.0005 [b]	1,2,4-Trichlorobenzene	0.005 [d]
Di(2-ethylhexyl)phthalate (DEHP)	0.004 [d]	1,1,1-Trichloroethane (1,1,1-TCA)	0.200 [b]
Dinoseb	0.007 [c, d]	1,1,2-Trichloroethane (1,1,2-TCA)	0.032 [b], 0.005 [c, d]
Diquat	0.02 [c, d]	Trichloroethylene (TCE)	0.005 [b]
Endrin	0.0002[b]	Trichlorofluoromethane (Freon 11)	0.15 [b]
Endothall	0.1 [c, d]	1,1,2-Trichloro-1,2,2-Trifluoroethane (Freon 113)	1.2 [b]
Ethylbenzene (Phenylethane)	0.680 [b]	Total THMs	0.08 [c]
Ethylene dibromide[b] (EDB)	0.00002 [b]	Vinyl chloride	0.0005 [b]
Glyphosate	0.7 [b]	Xylenes (single isomer or sum of isomers)	1.750 [b]
Heptachlor	0.00001 [b]		

Maximum Contaminant Levels [a]

Inorganics	Primary MCL (mg/L)	Inorganics	Primary MCL (mg/L)
Aluminum	1 [b], 0.05 [c]	Nitrate[e] (as Nitrogen)	10 [c]
Antimony	0.006 [c, d]	Nitrate + Nitrite (sum as Nitrogen)	10 [c, d]
Arsenic	0.05 [b], 0.01[c]	Nitrite (as Nitrogen)	1 [c, d]
Asbestos	7 MFL[c, d]	Selenium	0.01 [b]
Barium	1 [b]	Silver	0.05 [b]
Beryllium	0.004 [c, d]	Thallium	0.002 [c, d]
Cadmium	0.010 [b], 0.005 [c, d]	Fluoride[b]	
Chromium	0.05 [b]	Annual Average Maximum Daily °Fahrenheit (°F)	
Copper	1.3 [c, d]	<53.7 °F	2.4
Cyanide	0.15 [d]	53.8 to 58.3 °F	2.2
Lead	0.05 [b], 0.015 [c, d]	58.4 to 63.8 °F	2.0
Mercury	0.002 [b]	63.9 to 70.6 °F	1.8
Nickel	0.1 [d]	70.7 to 79.2 °F	1.6
Nitrate (as NO_3)	45 [b]	79.3 to 90.5 °F	1.4
Radioactivity	**Primary MCL (picoCuries[pCi]/L)**	**Radioactivity**	**Primary MCL (pCi/L)**
Gross alpha particle activity	15 [c, d]	Strontium-90	8 [c, d]
Gross beta particle activity	50 [d]	Tritium	20,000 [c, d]
Combined Radium-226 and Radium-228	5 [c, d]	Uranium	30 [c], 20 [d]

[a] Units are in mg/L unless indicated otherwise.
[b] RWQCB Region 3 Basin Plan MCLs for irrigation.
[c] USEPA MCLs for drinking water.
[d] California DHS MCLs for drinking water.
[e] MFL – Million Fibers per Liter, with fiber length >10 microns.

In addition, the permit may include the following specifications or limitations:

- The discharge of effluent will likely be limited to winter months, such as October through April, and only to prevent overloading of the percolation beds.
- Turbidity limits equal to CCR Title 22 recycled water standards will likely be required, as follows:
  - Daily average turbidity must be less than or equal to 2 nephelometric turbidity units (NTU).

- Turbidity must be less than 10 NTU at all times.
- Turbidity must not exceed 5 NTU for more than 5% of the time.

- Coliform concentration limits will likely include the following:
  - 7-day median concentration of 2.2 MPN per 100 milliliter (mL).
  - Cannot exceed 23 MPN per 100 mL in more than one sample taken over a 30-day range.
  - Cannot exceed 240 MPN per 100 mL at any time.

If chlorine disinfection is used, the permit would likely require a minimum CT value (chlorine concentration times modal contact time) of not less than 450 mg-minute/L at all times and a minimum modal contact time of 90 minutes based on peak flow.

For general constituents, such as BOD, TSS, nitrates, and coliform, likely requirements for river discharge are summarized in **Table 5-10**.

Table 5-10: Possible Effluent Limits for River Discharge

Constituent	Units	Daily max	30-day mean	7-day mean
BOD	mg/L	20	10	–
TSS	mg/L	20	10	–
Nitrate	mg/L	10	5	–
Total coliform	MPN/100-mL	240	23	2.2

5.3.2. Out of Basin Export to Ocean Outfall

Potential discharge requirements for ocean discharge would most likely require secondary level treatment. Federal guidelines for secondary treatment apply to ocean discharges. The SWRCB's Water Quality Control Plan for Ocean Waters of California, known as the Ocean Plan, establishes effluent limits achievable by alternative processes, such as advanced primary treatment. The Ocean Plan contains water quality objectives, requirements for effluent quality, and management of waste discharges, and discharge prohibitions. Effluent quality requirements establish limitations for grease and oil, solids, turbidity, pH, and toxicity. Limits are established for heavy metals, toxaphene, and radioactivity outside the zone of initial dilution.

Table 5-11: Possible Effluent Limits for Ocean Discharge Based on City of Watsonville [a]

Constituent	Units	30d average	7d average	Daily maximum
BOD	mg/L	30	45	90
CBOD	mg/L	25	40	75
TSS	mg/L	30	45	90
Oil and grease	mg/L	25	40	75
Settleable solids	mL/L	1.0	1.5	30
Turbidity	NTU	75	100	225
pH	-	6.0 – 9.0 at all times		
Total coliform	MPN/100-mL	NA	NA	85,000
Fecal coliform	MPN/100-mL	NA	NA	17,000
Enterococcus	MPN/100-mL	NA	NA	2,000

[a] Source: Draft WDR Order R3-2003-0040.

Table 5-12: Possible Effluent Limits for Ocean Discharge to Protect Marine Aquatic Life [a]

Constituent	Units	6-mo. Median	Daily maximum	Instantaneous maximum
Arsenic	µg/L	430	2,500	6,500
Cadmium	µg/L	85	340	850
Chromium (hexavalent)	µg/L	170	680	1,700
Copper	µg/L	87	850	2,400
Lead	µg/L	170	680	1,700
Mercury	µg/L	334	14	34
Nickel	µg/L	420	1,700	4,200
Selenium	µg/L	1,300	5,100	13,000
Silver	µg/L	46	220	580
Zinc	µg/L	1,000	6,100	16,000
Cyanide	µg/L	85	340	850
Total chlorine residual	µg/L	170	680	5,100
Ammonia (as Nitrogen)	µg/L	51,000	20,000	510,000
Acute toxicity	TUa	-	2.8	-
Chronic toxicity	TUc	-	85	-
Phenolic compounds (nonchlorinated)	µg/L	2,600	10,000	26,000
Chlorinated phenolics	µg/L	85	340	850
Endosulfan	µg/L	.76	1.5	2.3
Endrin	µg/L	0.17	0.34	0.51
HCH	µg/L	0.34	0.68	1.0
Radioactivity	Not to exceed limits specified in Title 17, Division 1, Chapter 5, Subchapter 4, Group 3, Article 3, Section 30253 of the CCR.			

[a] Source: Draft WDR Order R3-2003-0040, City of Watsonville.

Table 5-13: Possible Non-Carcinogen Effluent Limits for Ocean Discharge a

Constituent	30d average [b]	Constituent	30d average [b]
Acrolein	1.9×10^4	4,6-dinitro-2-methylphenol	1.9×10^4
Antimony	1.0×10^5	2,4-dinitrophenol	340
Bis(2-chloroethoxy) methane	370	Ethylebenzene	3.5×10^5
Bis(2-chloroisopropyl) ether	1.0×10^5	Fluoranthene	1.3×10^3
Chlorobenzene	4.8×10^4	Hexachlorocyclopentadiene	4.9×10^3
Chromium (III)	1.6×10^7	Nitrobenzene	420
di-n-butyl phthalate	3.0×10^5	Thallium	170
Dichlorobenzenes	4.3×10^5	Toluene	7.2×10^6
Diethyl phthalate	2.8×10^6	Tributyltin	0.12
Dimethyl phthalate	7.0×10^7	1,1,1-trichloroethane	4.6×10^7

[a] Source: Draft WDR Order R3-2003-0040, City of Watsonville.
[b] Units are in mg/L unless indicated otherwise.

Table 5-14: Possible Carcinogen Effluent Limits for Ocean Discharge [a]

Constituent	30d average [b]	Constituent	30d average [b]
Acrylonitrile	8.5	1,2-diphenylhydrazine	14
Aldrin	1.9×10^{-3}	Halomethanes	1.1×10^4
Benzene	500	Heptachlor	4.2×10^{-3}
Benzidine	5.9×10^{-3}	Heptachlor epoxide	1.7×10^{-3}
Beryllium	2.8	Hexachlorobenzene	0.018
Bis(2-chloroethyl) ether	3.8	Hexachlorobutadiene	1.2×10^3
Bis(2-ethylhexyl) phthalate	300	Hexachloroethane	210

Constituent	30d average [b]	Constituent	30d average [b]
Carbon tetrachloride	76	Isophorone	6.2×10^4
Chlordane	2.0×10^{-3}	N-nitrosodimethylamine	620
Chlorodibromomethane	730	N-nitrosodi-N-propylamine	32
Chloroform	1.1×10^4	N-nitrosodiphenylamine	210
DDT	0.014	PAHs	0.75
1,4-dichlorobenzene	1.5×10^3	PCBs	1.6×10^{-3}
3,3'-dichlorobenzidine	0.7	TCDD equivalents	3.3×10^{-7}
1,2-dichloroethylene	2.4×10^3	1,1,2,2-tetrachloroethane	200
1,1-dichloroethylene	76	Tetrachloroethylene	170
Dichlorobromomethane	530	Toxaphene	0.018
Dichloromethane	3.8×10^4	Trichloroethylene	2.3×10^3
1,3-dichloropropene	760	1,1,2-trichloroethane	800
Dieldrin	3.4×10^{-3}	2,4,6-trichlorophenol	25
2,4-dinitrotoluene	220	Vinyl chloride	3.1×10^3

[a] Source: Draft WDR Order R3-2003-0040, City of Watsonville
[b] Units are in mg/L unless indicated otherwise.

For general constituents, such as BOD, TSS, nitrates, and coliform, likely requirements for ocean discharge are summarized in **Table 5-15.**

Table 5-15: Possible Effluent Limits for Ocean Discharge

Constituent	Units	30d average	7d average	Daily maximum
BOD	mg/L	30	45	90
TSS	mg/L	30	45	90
Nitrate	mg/L	NA	NA	NA
Total coliform	MPN/100-mL	NA	NA	85,000

5.4. Reclamation

5.4.1. General

The RWQCB and California DHS have primary responsibility for implementing recycled water projects in the State of California. However, under the Porter-Cologne Act, the DHS has authority to establish criteria for recycled water production, distribution, and use wherever special protection of public health is required. DHS has developed comprehensive recycled water regulations that define treatment processes, water quality criteria, and treatment reliability requirements for public use of recycled water. These regulations are contained in Title 22, Division 4, Chapter 3 of the California Administrative Code, more commonly referred to simply as Title 22.

Approved by the State in December 2000, Title 22 prescribes recycled water criteria, which are divided into several categories based upon the extent of public access or risk of exposure. In general, Title 22 regulations are more stringent for uses with high public contact potential and less stringent for uses with low public contact potential. Depending on the use, Title 22 establishes four levels of treatment required for recycled water, including undisinfected secondary, undisinfected secondary-23, undisinfected secondary-2.2, and disinfected tertiary.

Undisinfected Secondary Recycled Water. This category of recycled water is wastewater that has been treated to a secondary treatment level and is commonly referred to as secondary effluent. Secondary effluent is wastewater that contains DO and has undergone an oxidation process in which the organic matter content of the water has been stabilized and made nonputrescible.

Undisinfected Secondary-23 Recycled Water. This category of recycled water is secondary effluent that has been disinfected to a level such that the median number of coliform bacteria in the water does not exceed

23 per 100 mL. Disinfection is the process whereby pathogenic bacteria and virus are inactivated by chemical, physical, or biological means.

Disinfected Secondary-2.2 Recycled Water. This category of recycled water includes secondary effluent that has been disinfected to a level such that the median number of coliform bacteria in the water does not exceed 2.2 per 100 mL.

Disinfected Tertiary Recycled Water. This category of recycled water includes secondary effluent that has undergone tertiary treatment and has been disinfected to a level such that the median number of coliform bacteria in the water does not exceed 2.2 per 100 mL. Title 22 defines the tertiary treatment process as wastewater that has been oxidized, coagulated, clarified, and filtered. The recycled water turbidity should not exceed two NTU on average, should not exceed 5 NTU more than five percent of the time during any 24-hour period, and should never exceed 10 NTU.

5.4.2. Suitable Uses for Recycled Water

A summary of approved uses for various types of recycled water is presented in **Table 5-16.**

Table 5-16: Suitable Uses of Recycled Water [a]

Use of recycled water	Treatment Level		
	Tertiary	Secondary -2.2	Secondary -23
Irrigation of:			
Food crops—contact with edible portion of crop	Allowed	Not allowed	Not allowed
Parks and playgrounds	Allowed	Not allowed	Not allowed
School yards	Allowed	Not allowed	Not allowed
Residential landscaping	Allowed	Not allowed	Not allowed
Unrestricted access golf courses	Allowed	Not allowed	Not allowed
Any other irrigation uses not prohibited by other provisions of CCR	Allowed	Not allowed	Not allowed
Food crops – edible portion above ground. not in contact with reclaimed water	Allowed	Allowed	Not allowed
Cemeteries	Allowed	Allowed	Allowed
Freeway landscaping	Allowed	Allowed	Allowed
Restricted-access golf courses	Allowed	Allowed	Allowed
Ornamental nursery stock and sod farms	Allowed	Allowed	Allowed
Pasture for milk animals	Allowed	Allowed	Allowed
Any nonedible vegetation with access control to prevent use as if it were a park, playground, or schoolyard	Allowed	Allowed	Allowed
Orchards with no contact between edible portion and reclaimed water	Allowed	Allowed	Allowed
Vineyards with no contact between edible portion and reclaimed water	Allowed	Allowed	Allowed
Non-food bearing trees not irrigated <14 days of harvest	Allowed	Allowed	Allowed
Fodder crops (e.g., alfalfa) and fiber crops (e.g., cotton)	Allowed	Allowed	Allowed
Seed crops not eaten by humans	Allowed	Allowed	Allowed
Food crops that undergo commercial pathogen-destroying processing before human consumption (e.g., sugar beets)	Allowed	Allowed	Allowed
Supply for Impoundments:			
Nonrestricted recreational impoundment, with supplemental monitoring for pathogenic organisms	Allowed [b]	Not allowed	Not allowed
Restricted impoundment and fish hatcheries	Allowed	Allowed	Not allowed
Landscape impoundment. Without decorative fountains	Allowed	Allowed	Allowed
Supply for cooling or air conditioning:			
Industrial or commercial cooling or air conditioning with cooling tower, evaporative condenser, or a spraying that creates a mist	Allowed [c]	Not allowed	Not allowed
Nonrestricted recreational impoundment, with supplemental monitoring for pathogenic organisms.	Allowed [b]	Not allowed	Not allowed
Other uses:			
Flushing toilets and urinals	Allowed	Not allowed	Not allowed

Use of recycled water	Treatment Level		
	Tertiary	Secondary -2.2	Secondary -23
Priming drain tap	Allowed	Not allowed	Not allowed
Industrial process water that may contact workers	Allowed	Not allowed	Not allowed
Structural fire fighting	Allowed	Not allowed	Not allowed
Decorative fountains	Allowed	Not allowed	Not allowed
Commercial laundries	Allowed	Not allowed	Not allowed
Consolidation of backfill material around potable water pipelines	Allowed	Not allowed	Not allowed
Artificial snow making for commercial outdoor uses	Allowed	Not allowed	Not allowed
Industrial boiler feed	Allowed	Allowed	Allowed
Nonstructural fire fighting	Allowed	Allowed	Allowed
Backfill consolidation around nonpotable piping	Allowed	Allowed	Allowed
Soil compaction	Allowed	Allowed	Allowed
Mixing concrete	Allowed	Allowed	Allowed
Dust control on roads and streets	Allowed	Allowed	Allowed
Cleaning roads, sidewalks, and outdoor work areas	Allowed	Allowed	Allowed
Flushing sanitary sewers	Allowed	Allowed	Allowed

[a] Refer to full text of the current version of Title 22.
[b] Additional monitoring may be necessary with conventional treatment.
[c] Drift eliminators and/or biocides are required if public or employees can be exposed to mist.

SECTION 6

Evaluation of Wastewater Treatment Alternatives

6. Evaluation of Wastewater Treatment Alternatives

The wastewater treatment selection is closely related to the effluent management strategy. After initial screening of wastewater treatment plant processes, two factors arose that limited the treatment plant alternatives. First, the Hollister City Council along with other stakeholders decided that the City has a long-term goal of maximizing the use of recycled water from the treatment plant. Because of this filtration and disinfection to meet Title 22 recycled water requirements are necessary of all of the treatment plant alternatives. Second, through correspondence with the Regional Water Quality Control Board (**Appendix F**) it became clear that any effluent strategy that continued to rely on percolation would result in strict effluent limitations on nitrates. With this in mind, only processes including nitrification and denitrification were considered for further investigation. The following treatment alternatives were assessed:

- Extended Aeration System
- Oxidation Ditch
- Immersed Membrane Bioreactor (MBR)
- Sequencing Batch Reactor

Various treatment designs are possible and process selection involves consideration of many factors, including:

- wastewater effluent management
- wastewater strength
- process reliability
- operational requirements
- treatment flexibility
- available space
- solid waste disposal
- nuisance odor
- visual aesthetics
- capital and operating costs
- discharge standards
- ease or difficulty of permitting

Of the factors identified above, the method of wastewater effluent management and the restrictions imposed therein will have the greatest effect on the type of treatment required. Wastewater treatment plants in the State must be permitted by the State. WDRs and operating criteria are imposed on these plants through their permits. Depending on each plant's individual permit, design of a WWTP will be directed at meeting its specific discharge requirements and different unit processes will be assembled to achieve that goal.

This Section discusses alternative wastewater treatment conceptual design for upgrading the DWTP and summarizes the factors influencing their design and implementation. It is organized into the following subsections:

- Design Considerations
- Design Criteria
- Wastewater Treatment Alternatives
- Estimated Cost

6.1. Long-Term Wastewater Treatment Design Considerations

Design of the WWTP must balance the technical requirements of providing adequate and reliable treatment performance with more intangible factors that can affect which alternative design is selected. At a minimum, such factors include consideration of site limitations and good neighbor features that affect how the facility is perceived by the surrounding community.

6.1.1. Site Constraints

Evaluation of alternative treatment modifications and upgrades to increase the DWTP capacity must take into account inherent site constraints. Potential limitations arising from physical size, site geology, topography, and institutional issues are considered in the analysis. Based on a preliminary review of the existing site, the following potential site constraints were identified:

- limited hydraulic head due to the generally flat terrain at the DWTP,
- increased design requirements and construction efforts on new structures to offset the effects of the high groundwater level,
- limited expansion opportunities beyond the existing 50-acre treatment pond area, and
- construction limitations on work in close proximity to Highway 156.

6.1.2. Good Neighbor Factors

The DWTP is located on the outskirts of the City, but is locally situated among commercial, agricultural, and residential development. It is also adjacent to Highway 156, which experiences heavy vehicular traffic. Due to the close proximity to generally populated areas, any alternative evaluation will consider factors that could influence how the DWTP is perceived by the public during both operation and construction. In turn, this evaluation will also consider potential impacts on the health and well-being of operations staff. At a minimum, good neighbor factors will include potential issues over visual aesthetics, noise, and air quality.

Aesthetic Issues. Aesthetic issues pertaining to possible new on-site and off-site facilities will be incorporated in the alternative evaluation. In addition to the architectural appearance of structures, the aesthetic influence of exposed pipes, pumps, maintenance vehicles, and other equipment visible to passersby will also be considered. Consideration will be given to the impacts of any possible nighttime activities that could produce additional illumination to the surrounding area. Control on operational hours and/or the use of focused, directional lighting could be considered to minimize nighttime lighting disturbance.

Noise Level Concerns. Excessive noise possibly resulting from construction, routine operation, and traffic will be considered in any alternative evaluation. Identified nuisance noise will either be eliminated or mitigated to minimize public disturbance from wastewater operations and/or construction. Noise impact on operations personnel will also be considered and minimized through proper specification of equipment and sound-adsorbing enclosures or isolation. Maximum noise levels for working areas will meet California Occupational Safety and Health Administration (Cal-OSHA) requirements.

Air Quality Concerns. Wastewater treatment plants can be sources of odor, chemical emissions, particulates, and aerosols, all of which must be controlled. Air quality concerns that pose a risk to human health are addressed by the Federal Clean Air Act and locally controlled by the Regional Air Quality Control Board. Proposed alternatives will meet state and federal air quality requirements through containment and/or treatment of potentially harmful emissions releases. Aerosols and particulates from plant operations and construction will be further minimized.

Strong nuisance odors from wastewater treatment and discharge will be considered and mitigated with any alternative evaluation. The City has received odor complaints in the past, particularly when the treatment ponds turn. Consequently, alternative processes will include provisions to minimize odor concerns through the use of an odor control process, which, at a minimum, could include the following:

- Selection of low-odor solids-handling processes;
- installation of biofilters or scrubbers for foul air streams;
- dilution with odor-free gases;
- containment through the use of enclosures;
- use of masking agents; and
- chemical oxidation and precipitation of odor-causing compounds in the wastewater.

6.2. Design Criteria

Specific process goals for preliminary design of each WWTP alternative are discussed in this Section. The following is a summary of the criteria, which were based on the regulatory and environmental requirements and input from the City:

- Processes should minimize potential for odors.
- Processes should minimize noise levels during construction and during normal operation.
- Sludge dewatering/handling facilities should be utilized.
- Processes should have long solids retention time (SRT) to produce stabilized sludge suitable for on-site sludge stabilization basins (SSBs).
- Nitrogen removal is required to meet more stringent TN and/or nitrate limits.
- Algae removal may be required to reduce solids loading to the percolation beds.
- Where appropriate and practical, WWTP designs should take advantage of existing site topography and facilities.
- Plant footprints should fit within the boundaries of the existing DWTP, particularly on the space currently occupied by the primary and stabilization ponds.

6.3. Wastewater Treatment Alternatives

Four alternative wastewater treatment processes were considered for evaluation: (1) the extended aeration system, (2) an oxidation ditch, (3) immersed membrane bioreactors (MBR) and (4) sequencing batch reactors (4). These processes are representative of treatment processes capable of meeting the effluent limitations anticipated for the upgraded DWTP. Process and operational design parameters for each treatment alternative are summarized in **Table 6-1**. This Section describes the wastewater treatment processes evaluated in the LTWMP and presents preliminary design information on each alternative. Each treatment alternative was selected and developed to achieve specific goals consistent with and appropriate to the specific discharge point and scenario condition.

Table 6-1: Process and Operational Design Parameters for Treatment Alternatives

Process	Mean Cell Residence Time (MCRT) (day)	F:M (lb BOD/ lb MLVSS/day)	MLSS (mg/L)	HDT (hour)
1. Extended Aeration	20–40	0.04–0.10	2,000–5,000	20–30
2. Oxidation Ditch	15–30	0.04–0.10	3,000–5,000	15–30
3. MBR	10-30	0.05–0.40	8,000–20,000	8-20
4. SBR	10–30	0.04–0.10	2,000–5,000	15-40

6.3.1. Process Alternative 1—Extended Aeration System

Extended aeration systems are biological treatment processes that provide BOD removal and nitrification through lined aeration basins. Surface aerators or more efficient oxygen delivery systems, such as diffusers arrayed along the basin floor, can be utilize to enhance oxygen transfer efficiency (OTE).

Aeration provides an aerobic environment necessary for BOD removal and nitrification while maintaining the solids in suspension. Process design and operational parameters for the extended aeration process are shown in **Table 6-1**. Extended MCRTs allow efficient BOD removal and nitrification processes to occur.

Denitrification can be accomplished through an add-on process or by design using the aeration basin and aeration equipment, respectively. One add-on process is the construction of a separate basin upstream of the aeration basin that can support an anoxic environment where denitrifying microorganisms can synthesize soluble nitrate into nitrogen gas. Alternatively, the aeration basin can be designed to use flexible headers connected to diffusers that span the basins, perpendicular to the direction of flow. Denitrification can then be achieved simultaneously in the same basin by alternating the flow of air to the headers to provide traveling aerated and anoxic zones within the single aeration basin.

Following solids separation by the final clarifier, additional treatment may be added depending on the discharge alternative. For discharge to a recycled water system, tertiary filtration would be required as an added process prior to disinfection by sodium hypochlorite. In the case of recycled water, chlorination is preferred over UV since maintaining a chlorine residual in recycled water distribution systems is desirable.

Solids produced from WWTP operations, such as the waste activated sludge (WAS), would be routed to the SSB where the solids are concentrated, compacted, and stabilized. SSBs are designed with sufficient capacity to provide long-term stabilization of the sludge, with some facilities operating up to 10 years without requiring removal of accumulated sludge. Alternatively, the solids could be dewatered and hauled to a sludge disposal site.

The extended aeration system preliminary design incorporates several effluent management alternatives. A process train required for discharge to percolation beds, surface discharge and recycled water is shown in **Figure 6-1**.

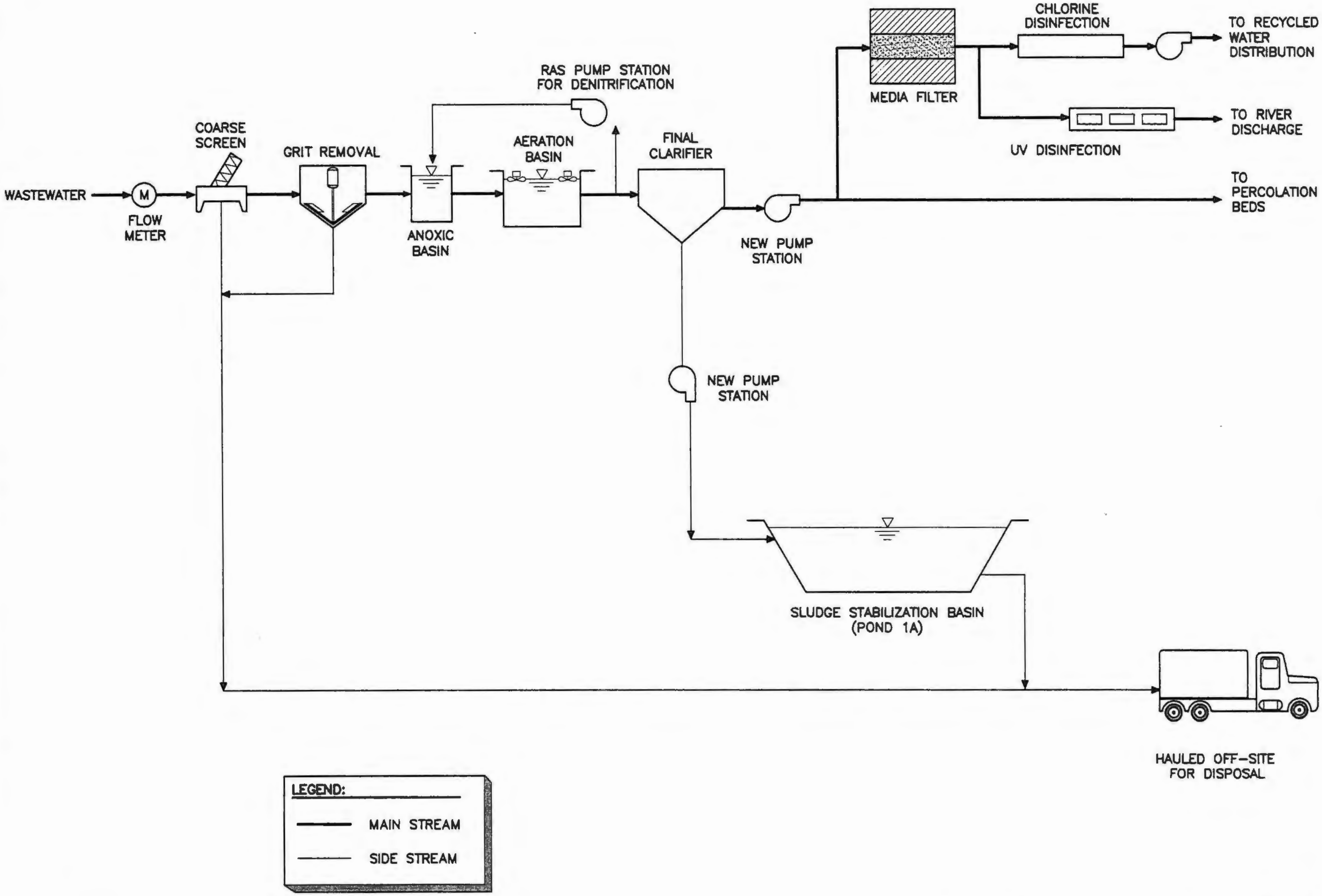


Figure 6-1
City of Hollister Long-Term Wastewater Mangement Program
Extended Aeration System Process Flow Diagram

HydroScience Engineers, Inc.

S:\common\projects\Hollister\LTWMP\Report\LTWMP 2005\LTWMP December 2005\Figures\Section 6 Figures\FIG 6-1.dwg DATE:1/27/06

6.3.1.1. Facility Design

The following extended aeration facility design is based on a preliminary estimate of flows presented in **Section 4**. Facility design of the extended aeration alternative was completed on a preliminary level. A conceptual site layout is included in **Figure 6-2** showing major facility sizes and locations for treating 5.0 MGD ADF. Future additional facilities are also shown to illustrate expandability to the proposed new buildout flow of 7.5 MGD ADF. Unit process summaries for major processes are included in **Table 6-2**.

Table 6-2: Unit Process Summary for the Extended Aeration System

Unit Process [a]	Design Criteria [b]	Size (ft) [c]	Total units at ADF	
			5.0 MGD	7.5 MGD
Flow Meter	Range 0-28 mgd, 0.25 fps min., 33 fps max.	16 inch Ø	1	1
Screen	Inclined rotary in-channel type 0.25-inch slot width	6 Ø	1	2
Grit Chamber	Vortex type	12 Ø	1	2
Aeration Basin	20d MCRT 3,000 mg/L MLVSS	208L x 248W x 10D	2	3
Final Clarifier	< 400 gpd/ft^2/d, ADF < 800 gpd/ft^2/d, PHF < 1 lb/ft^2/hour, ADF < 1.4 lb/ft^2/hour, PHF	90Ø x 14D	2	3
UV Disinfection	Total coliform MPN 2.2 per 100 mL sample (surface discharge)	TBD	1 channel	1 channel
Tertiary Filtration	Average turbidity < 2 NTU 2.5 gpm/ft^2 at ADF with 1 cell out of service, 5.0 gpm/ft^2 at PHF	16.7L x 16.7W	6	8
Chlorination	Contact time = 120 minutes @ 5.5 mgd	435L x 8W x 9D	2	3
Sludge Stabilization Basin	15 lb MLVSS/ 1000 sq-ft/ d	38 MG	1	1

[a] Design is based on ADF.
[b] Minimum design freeboard is 2 ft.
[c] Length, width, depth, height, and diameter are denoted as L, W, D, H, and Ø respectively. Units in ft unless noted otherwise.

Modifying the DWTP into an extended aeration system would involve extensive retrofits to most of the existing facility. This alternative would accommodate new primary, secondary, and tertiary treatment. The necessary modifications of key components are described below.

Headworks

Due to concerns related to flow measurement and odors, the Regional Board issued a Cease and Desist Order (**Appendix B**) that required a new headworks be constructed at the existing plant prior to construction of the long-term wastewater treatment facilities. The headworks upgrade was completed during the summer of 2003 as the initial construction in the phased approach and is currently in operation. To control odors and improve flow measurement, a new influent lift station was constructed. It was equipped with a mechanical grinder, an odor control biofilter, and a magnetic flow meter. Flow measurement is accomplished by a magnetic flow meter installed in a section of pipe that is always submerged. The headworks improvements can be integrated into any new design alternative.

Influent Pump Station

In order to minimize excavation required at the location selected for the extended aeration basins, the influent pump station (incorporated in the new headworks) would be required to lift the wastewater to the

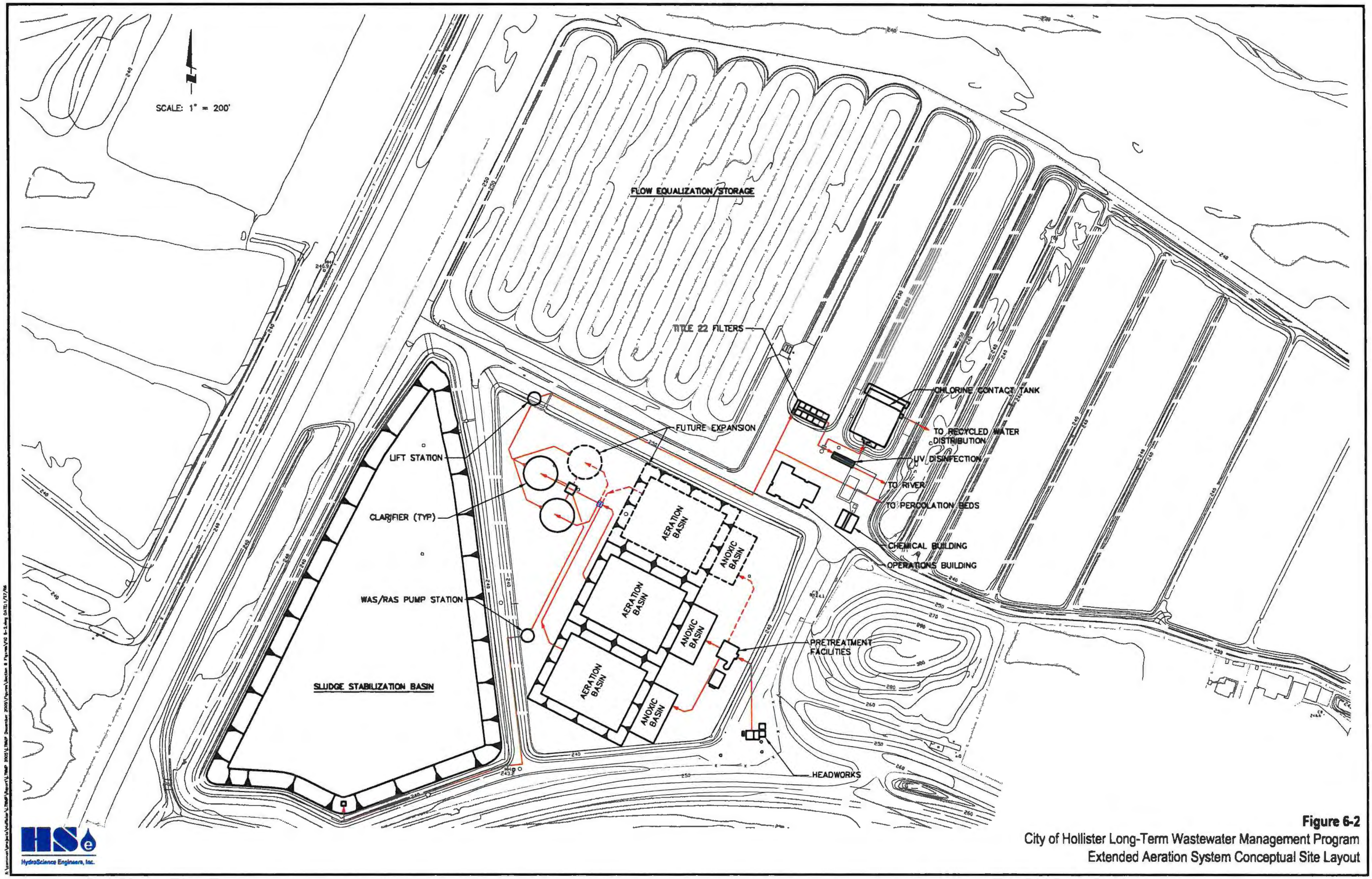


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Figure 6-2
City of Hollister Long-Term Wastewater Management Program
Extended Aeration System Conceptual Site Layout

high water level in the pretreatment facilities. Once pumped to this elevation, the remainder of the flow through the biological processes would be by gravity. The influent pump station has a high level overflow that diverts wastewater to an equalization basin (Pond 1B) in the event the pump station fails or cannot match the influent flow. The pump station is designed to handle the design peak hour flow. Space has been provided for addition of future pumps for expansion to the future buildout peak hour flow.

Pretreatment

The pretreatment facilities consist of screening, grit removal and flow distribution. All wastewater flows into a common rectangular channel at the beginning of the pretreatment facility. A flow-splitting structure allows the flow to be split to two identical channels. One channel houses a self-cleaning fine screen. The second channel is a bypass channel and contains a manual bar screen. Under normal operation, all wastewater flows through the self-cleaning coarse screen. However, a weir allows wastewater to either overflow or be diverted to the bypass channel, in the event the self-cleaning screen fails or is down for maintenance.

The self-cleaning screen is an inclined in-channel rotary screen. This type of screen utilizes a slotted or perforated cylinder as the screen. The cylinder is mounted in the rectangular channel at a 45-degree angle and a helical screw/scraper conveys solids up the cylinder into a dewatering section and then into a holding bin. The advantage of using this type of screen is that the screening, washing and compacting of the screened material is accomplished in one unit. Another advantage is that the top portion of the screen (above the channel) can be enclosed for odor control, as well as the solids discharge shaft to the screenings bin.

Following screening, the channel allows future addition of grit removal. Grit removal would not necessarily be required for the extended aeration alternative. If selected, a vortex type grit chamber would be designed to separate the grit from the screened wastewater. The grit would be pumped to a grit classifier to remove organics from the inert grit and to dewater the grit. The grit classifier and grit bin would be housed in a building to contain odors and minimize vector attraction.

All pretreatment channels, screening and grit facilities are enclosed to contain foul odors. A blower and a biofilter scrub foul air for odor removal. The blower continuously pulls air from the headspace in the enclosed facility. This maintains a negative pressure in the structure so that air cannot escape from the facility. The blower discharges into an odor control biofilter. The biofilter can be a compost design or a packaged synthetic media design.

Extended Aeration System

The extended aeration system would consist of a square concrete basin with a series of aeration headers and diffuser assemblies. The extended aeration basins could be designed with vertical or sloped sidewalls. Two separate extended aeration process trains would be provided for flexibility for O&M of the system over a wide range of flows. The existing primary Pond 1B would be converted to accommodate the basins. Each basin would be approximately 208 ft wide by 248 ft long by 10 ft side water depth and have a volume of approximately 3.0 MG each. Space would be designated for addition of a third extended aeration system in the future to meet future buildout flows.

The system would contain an anoxic zone upstream of an aerated zone. Raw wastewater would be blended with a recycled stream of oxidized/nitrified effluent from the aeration zone and then introduced to the anoxic zone, where anoxic bacteria will accomplish denitrification. The raw wastewater blend is required to provide a source of carbon for the biological denitrification process. From the anoxic zone, the effluent would flow by gravity to the aeration zone. The aeration zone would contain an aeration system sized to accomplish both BOD removal and nitrification. It may be possible to use the existing surface aerators, though more efficient aeration systems may provide improved performance and lower operating costs.

Alternatively, denitrification could be achieved in the same basin by alternating aerated and anoxic zones, if certain proprietary aeration systems are utilized. In such a system, only one basin would be required, though the total basin volume required would be similar to the two-basin system described above.

A portion of the activated sludge that settles in the clarifiers would be returned to the extended aeration system to maintain the required mixed liquor concentration. Excess sludge would be wasted to the sludge stabilization basin. Typical SRTs in the extended aeration system are 20 days or greater. This results in a partially digested and stabilized biomass.

From the basins, the two process streams would be combined and advance to a flow-splitting structure upstream of the clarifiers. The wastewater would flow by gravity through the extended aeration system to the secondary clarifiers.

Clarifiers

Two circular clarifiers would be provided for secondary sedimentation. A flow-splitting structure upstream of the clarifiers would ensure even distribution of flow to the two clarifiers. Each clarifier would have a working diameter of approximately 90 ft and a working depth of 14 ft. A surface skimmer would remove floating material, while scrapers at the bottom would collect sludge for return to the extended aeration system or the SSB. From the clarifiers, water would flow to a wet well to pump water to Title 22 filters for river discharge or recycled water production. Space would be designated for addition of a third clarifier in the future to meet future buildout flows. Clarified effluent may be sent directly to percolation beds or first through the filters prior to percolation.

Sludge Stabilization Basin

Existing Primary Pond 1A would be converted into a sludge stabilization basin (SSB). WAS would be collected from the secondary clarifiers for further stabilization in the SSB. The SSBs would have enough capacity to provide long-term storage. Based on the size of the existing Pond 1A, it is expected that the sludge storage capacity would exceed 10 years.

Solids Dewatering

As an option waste sludge from the clarifiers could be mechanically dewatered. The dewatered sludge would be taken to a landfill for disposal. Note that this sludge would not meet Class B requirements and could not be eligible for beneficial reuse without further treatment. At a minimum a facility including a sludge storage tank, sludge feed pump, polymer feed system and a two-meter belt filter press would be required for the initial construction. Provisions for adding a second belt press would be made. The belt press and ancillary equipment would be housed in building to protect the equipment from weather and to contain any odors. Dewatered sludge from the belt filter press would be conveyed via a screw conveyor to a waste container or truck trailer.

Flow Equalization and Storage

Ponds 2, 3A, and 3B would be converted to storage for flow equalization and/or storage of treated effluent. Accumulated sludge in these ponds will be removed. New inlet and outlet structures would be constructed to allow movement of screened influent or recycled water in to and out of these ponds.

UV Disinfection

For effluent to be discharged to a surface water, UV disinfection is proposed to eliminate the need for dechlorination and to eliminate the potential for chlorine residual discharge violations. It is expected that a maximum total coliform MPN of 2.2 per 100 mL will be required. Space would be provided in the channel for addition of future banks for expansion to future buildout flows. Validation testing for Title 22 certification would not be required. It is anticipated that no disinfection limits would be required on effluent discharged to the percolation beds. Therefore, this effluent stream could bypass the UV channel or chlorination system and be applied to the percolation beds as undisinfected secondary or undisinfected tertiary effluent.

Title 22 Media Filter

Media filtration would follow the clarifiers for additional effluent polishing and for the production of recycled water. Media filtration would be required to meet the Title 22 *Water Recycling Criteria.* The *Water Recycling Criteria* includes minimum design requirements, certifications, and turbidity requirements. It is expected that recycled water would only be required during the dry season. Thus, the Title 22 filtration facilities would be sized based on the design ADF. Space would be designated for addition of future filtration facilities to meet the future buildout ADF.

Two types of single media sand filters have proven most effective for Title 22 applications. One type utilizes a sand filter with a continuous backwash mechanism. Continuous backwash rates are set by adjusting weir levels within the filter. Another system utilizes a conventional downflow sand filter with intermittent backwash cycles. In this system, backwash cycles are controlled by an increase in water depth above the filter or an increase in headloss through the filter.

A third filter alternative is the use of a cloth media filter. This filter utilizes a cloth media mounted on a disk as the filtration barrier to remove solids. Flows directions can either be outside-in or inside-out on these types of filters. The cloth media filters are equipped with a backwash system to clean the filter media when it becomes clogged with solids.

Any filtration systems require the addition of flocculants, such as alum and/or polymers. Each type of filtration system would be adequate for this process train.

Chlorine Disinfection

Chlorine disinfection is preferred for water recycling applications in order to provide a residual in the recycled water distribution system. Thus, a chlorine disinfection system would be provided for the Title 22 recycled water sidestream. Effluent from the Title 22 filters would flow to the chlorine disinfection system. The proposed disinfection system would use sodium hypochlorite as the disinfectant. Disinfection would be accomplished in a chlorine contact basin sized to meet Title 22 *Water Recycling Criteria.* The criteria require that the basin provide a minimum modal contact time of 90 minutes and a minimum CT of 450 mg-minutes/L. Thus, for a modal contact time of 90 minutes, the minimum chlorine residual in the chlorine contact basin would be 5 mg/L. The chlorine contact tank would be designed for an HRT of 120 minutes at MDF (5.5 mgd) to ensure a modal contact time of 90. The basin would consist of a multi-pass structure with a minimum length to width ration of 40:1 to promote plug flow. Inlet/outlet structures and knockout walls would be provided to allow additional passes to be constructed to meet future buildout flows.

Recycled Water Pump Station

A recycled water pump station would be required for recycled water distribution. The size and type of pumps required would be determined based on the hydraulic flow and storage characteristics and requirements of the recycled water distribution system.

Chemical Storage and Handling Facilities

The chlorine disinfection system would require sodium hypochlorite, which would be stored in a 8,000-gallon polyethylene tank. Duty and standby metering pumps would be provided for supply of sodium hypochlorite to the chlorine contact tank. It is expected that the metering pumps would be located indoors within an area for designed for spill containment. The chemical storage would be located outdoors in another spill containment structure. A canopy would be provided to shade the storage tank.

6.3.1.2. Non-economic Advantages/Disadvantages

The non-economic advantages and disadvantages of the extended aeration system are summarized in **Table 6-3.**

Table 6-3: Non-economic Advantages and Disadvantages of the Extended Aeration System

Advantages	Disadvantages
Easier to operate than some conventional sludge systems.	Larger footprint compared to conventional activated sludge systems.
Lower waste sludge production than conventional activated sludge plants.	Vulnerable to future regulatory change.
Achieves nitrogen removal.	Add-on process for nitrogen removal may be required to ensure reliable treatment performance.
Minimal chemical storage/handling.	Most extended aeration systems produce lower quality effluent than conventional treatment systems.
	Vulnerable to bulking sludge.

6.3.2. Process Alternative 2—Oxidation Ditch

The oxidation ditch is based on a conventional activated sludge process modified for nitrogen removal and augmented with a tertiary treatment process. An oxidation ditch is a variation of the activated sludge process that reliably produces a high quality effluent. The design is well established, relatively easy to operate, and produces effluent with low SS, TN, and BOD.

Compared to the extended aeration system, the oxidation ditch is more mechanically intensive, requiring additional pumps and controls to moderate process dynamics for the use of return activated sludge (RAS) and WAS, respectively. Discharge alternatives for consideration include the percolation bed, water recycling, and river discharge.

Oxidation ditches are biological treatment processes that achieve BOD removal and combined nitrification and denitrification through a plug-flow reactor design, as opposed to the previous complete-mix-type basins. This difference in the process reactor takes advantage of a different aeration method, which in turn changes the biochemical kinetics but still achieves the same treatment objectives. In an oxidation ditch, the wastewater is aerated with brush, disk, or surface aerators that introduce the oxygen required for microorganisms to metabolize the BOD. At the same time, these aerators impart a velocity to the water that causes it to recirculate around the oxidation ditch, which is designed around a racetrack configuration. As the wastewater is brushed along a racetrack, oxygen is transferred producing an aerobic zone where BOD removal and nitrification occur. As the wastewater continues down the racetrack, oxygen becomes depleted leaving an anoxic zone where denitrification occurs.

As microorganisms in the oxidation ditch metabolize BOD, biomass is produced and later settled. Downstream of the oxidation ditch, the final clarifier separates the biomass through gravitational settling. Since the settled solids are rich in biomass, a portion of the settled sludge is either returned to the oxidation ditch (RAS) to maintain an adequate population of microorganisms or removed from the process entirely for disposal (WAS).

Clarified effluent continues down the process train undergoing additional treatment depending on the discharge capacity and/or discharge point. If the discharge point is surface-discharge to the river, then the clarified effluent must first be filtered to meet possible turbidity limits on the river and then disinfected with UV light. UV disinfection is preferred for river discharge since it avoids chemical addition, such as with chlorination, which increases the risk of DBP formation. Disinfection by UV would allow the facility to consistently and reliably meet the stringent coliform limits for a surface discharge. For discharge to a recycled water system, tertiary filtration would be required as an added process prior to disinfection by sodium hypochlorite.

Waste sludge and solids residuals would be disposed of in one of the existing facultative treatment ponds, which would be converted to an SSB. At the SSB, the solids residuals are concentrated, compacted, and further stabilized. SSBs are designed with sufficient capacity to provide long-term stabilization of the sludge, with some facilities operating up to 10 years without requiring removal of accumulated sludge. Alternatively, the solids could be dewatered and hauled to a sludge disposal site.

The extended aeration system preliminary design incorporates several effluent management alternatives. A process train required for discharge to percolation beds, surface discharge and recycled water only is shown in **Figure 6-3**.

6.3.2.1. Facility Design

The following oxidation ditch facility design is based on a preliminary estimate of flows presented in **Section 4**. Facility design of the oxidation ditch alternative was completed on a preliminary level. A conceptual site layout is included in **Figure 6-4** showing major facility sizes and location for treating 5.0 MGD ADF. Both alternatives (with and without water recycling) are summarized in this figure. Future additional facilities are also shown to illustrate expandability to the proposed new buildout flow of 7.5 MGD ADF. Unit process summaries for major processes are included in **Table 6-4.**

Table 6-4: Unit Process Summary for the Oxidation Ditch

Unit Process [a]	Design Criteria [b]	Size (ft) [c]	Total units at ADF 5.0 MGD	Total units at ADF 7.5 MGD
Flow Meter	Range 0-28 mgd, 0.25 fps min., 33 fps max.	16 inch ∅	1	1
Screen	Inclined rotary in-channel type 0.25-inch slot width	6 ∅	1	2
Grit Chamber	Vortex type	12 ∅	1	2
Oxidation Ditch	20d MCRT 3,000 mg/L MLVSS	200L x 80W x 14D	2	3
Final Clarifier	< 400 gpd/ft^2/d, ADF < 800 gpd/ft^2/d, PHF < 1 lb/ft^2/hour, ADF < 1.4 lb/ft^2/hour, PHF	90 ∅ x 14D	2	3
UV Disinfection	MPN 2.2 per sample (surface discharge)	TBD	1 channel	1 channel
Tertiary Filtration	Average turbidity < 2 NTU 2.5 gpm/ft^2 at ADF with 1 cell out of service, 5.0 gpm/ft^2 at PHF	16.7L x 16.7W	6	8
Chlorination	Contact time = 120 minutes @ 5.5 mgd	435L x 8W x 9D	2	3
Sludge Stabilization Basin	15 lb MLVSS/ 1000 sq-ft/ d	38 MG	1	1

[a] Design is based on ADF.
[b] Minimum design freeboard is 2 ft.
[c] Length, width, depth, height, and diameter are denoted as L, W, D, H, and ∅ respectively.

Modifying the DWTP into an oxidation ditch system involves extensive retrofits. The oxidation ditch system would include a new process for primary, secondary, and tertiary treatment. The necessary modifications of key components are described below.

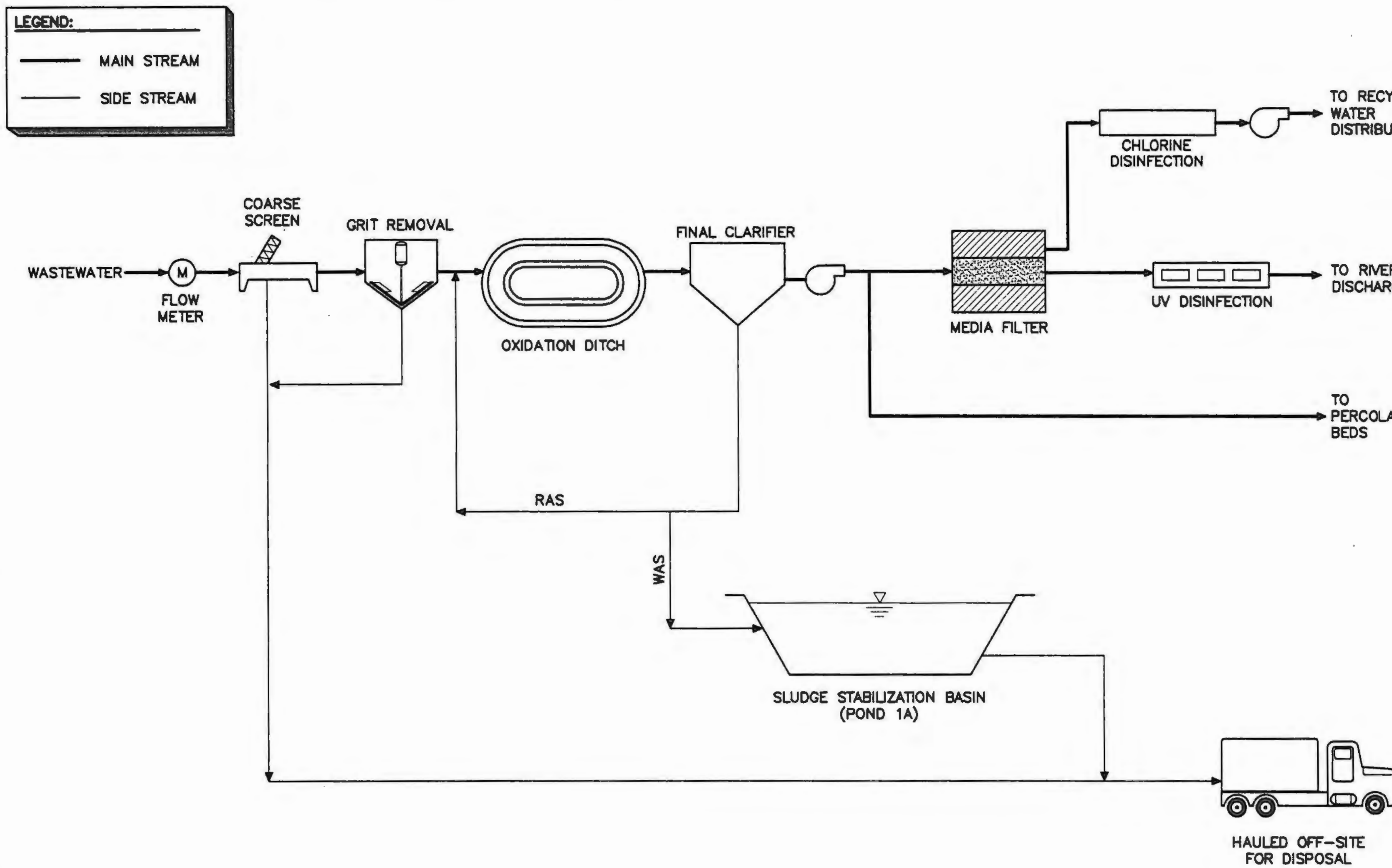

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Figure 6-3

City of Hollister Long-Term Wastewater Management Program

Oxidation Ditch Process Flow Diagram with Reclamation

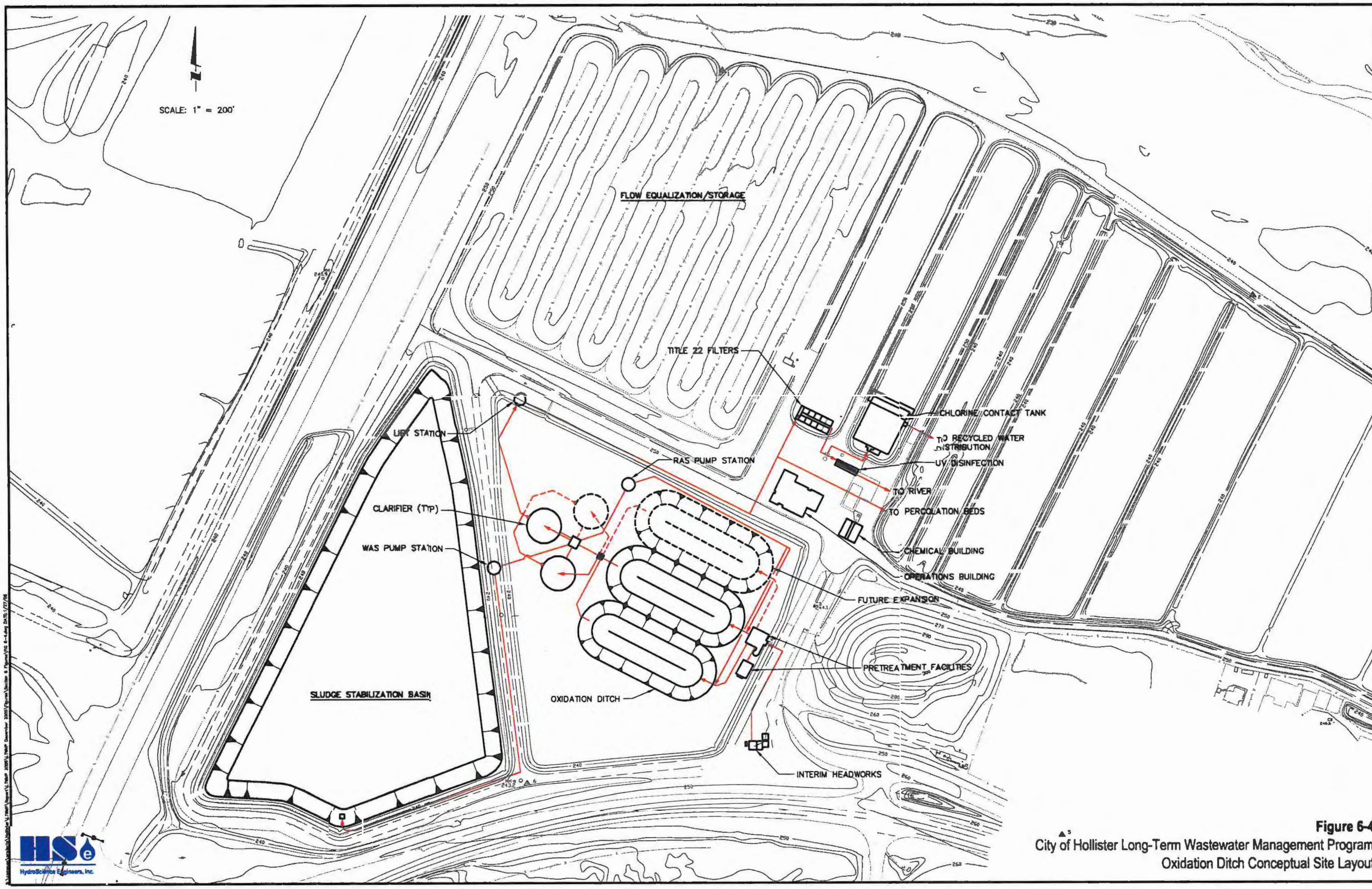

Figure 6-4
City of Hollister Long-Term Wastewater Management Program
Oxidation Ditch Conceptual Site Layout

Headworks

The existing headworks would be incorporated into the oxidation ditch design as detailed previously in **Section 6.3.1.1**.

Influent Pump Station

In order to minimize excavation required at the location selected for the oxidation ditch basins, the influent pump station (incorporated in the existing headworks) would be required to lift the wastewater to the high water level in the pretreatment facilities. Once pumped to this elevation, the remainder of the flow through the biological processes would be by gravity. The influent pump station has a high level overflow that diverts wastewater to an equalization basin (Pond 1B) in the event the pump station fails or cannot match the influent flow. The pump station is designed to handle the design peak hour flow. Space has been provided for addition of future pumps for expansion to the future buildout peak hour flow.

Pretreatment

The pretreatment facilities consist of screening, grit removal and flow distribution. All wastewater flows into a common rectangular channel at the beginning of the pretreatment facility. A flow-splitting structure allows the flow to be split to two identical channels. One channel houses a self-cleaning fine screen. The second channel is a bypass channel and contains a manual bar screen. Under normal operation, all wastewater flows through the self-cleaning coarse screen. However, a weir allows wastewater to either overflow or be diverted to the bypass channel, in the event the self-cleaning screen fails or is down for maintenance.

The self-cleaning screen is an inclined in-channel rotary screen. This type of screen utilizes a slotted or perforated cylinder as the screen. The cylinder is mounted in the rectangular channel at a 45-degree angle and a helical screw/scraper conveys solids up the cylinder into a dewatering section and then into a holding bin. The advantage of using this type of screen is that the screening, washing and compacting of the screened material is accomplished in one unit. Another advantage is that the top portion of the screen (above the channel) can be enclosed for odor control, as well as the solids discharge shaft to the screenings bin.

Following screening, the channel allows future addition of grit removal. Grit removal would not necessarily be required for the oxidation ditch alternative. If selected, a vortex type grit chamber would be designed to separate the grit from the screened wastewater. The grit would be pumped to a grit classifier to remove organics from the inert grit and to dewater the grit. The grit classifier and grit bin would be housed in a building to contain odors and minimize vector attraction.

All pretreatment channels, screening and grit facilities are enclosed to contain foul odors. A blower and a biofilter scrub foul air for odor removal. The blower continuously pulls air from the headspace in the enclosed facility. This maintains a negative pressure in the structure so that air cannot escape from the facility. The blower discharges into an odor control biofilter. The biofilter can be a compost design or a packaged synthetic media design.

Oxidation Ditch

The secondary treatment equipment would be installed on the site of the primary treatment pond 1B. That area is at a lower elevation than the headworks, therefore the wastewater would flow by gravity to the oxidation ditch.

The oxidation ditch system would provide a racetrack configuration containing aeration and anoxic zones. The oxidation ditch would be approximately 200 ft long by 80 ft wide by 14 ft deep and have a volume of approximately 3.2 MG. Two separate oxidation ditch process trains would be provided for flexibility for operation and maintenance (O&M) of the system over a wide range of flows. The existing primary pond

1B would be converted to accommodate this system. A portion of the activated sludge that settles in the clarifiers would be continuously returned to the oxidation ditch to maintain the required mixed liquor concentration. Excess sludge would be wasted to the SSB.

From the oxidation ditches, the two process streams would be combined and advance to a flow-splitting structure upstream of the clarifiers. The wastewater would flow by gravity through the oxidation ditch and to the secondary clarifiers.

Clarifiers

Two circular clarifiers would be provided for secondary sedimentation. A flow-splitting structure upstream of the clarifiers would ensure even distribution of flow to the two clarifiers. Each clarifier would have a working diameter of approximately 90 ft and a working depth of 14 ft. A surface skimmer would remove floating material, while scrapers at the bottom would collect sludge for return to the extended aeration system or the SSB. From the clarifiers, water would flow to a wet well to pump water to Title 22 filters for river discharge or recycled water production. Space would be designated for addition of a third clarifier in the future to meet future buildout flows. Clarified effluent may be sent directly to percolation beds or first through the filters prior to percolation.

Sludge Stabilization Basin

Existing Primary Pond 1A would be converted into an SSB. WAS would be collected from the secondary clarifiers for further stabilization. The storage basins would have enough capacity to provide long-term storage. Based on the size of the existing Pond 1A, it is expected that the sludge storage capacity would exceed 10 years.

Solids Dewatering

As an option waste sludge from the clarifiers could be mechanically dewatered. The dewatered sludge would be taken to a landfill for disposal. Note that this sludge would not meet Class B requirements and could not be eligible for beneficial reuse without further treatment. At a minimum a facility including a sludge storage tank, sludge feed pump, polymer feed system and a two-meter belt filter press would be required for the initial construction. Provisions for adding a second belt press would be made. The belt press and ancillary equipment would be housed in building to protect the equipment from weather and to contain any odors. Dewatered sludge from the belt filter press would be conveyed via a screw conveyor to a waste container or truck trailer.

Flow Equalization and Storage

Ponds 2, 3A, and 3B would be converted to storage for flow equalization and/or storage of treated effluent.

Title 22 Media Filtration

The design of the media filters would utilize the same approach detailed previously in **Section 6.3.1.1.** However, it is expected that media filtration would be sized for both surface water discharge and recycled water production.

UV Disinfection

For surface water discharge, it is assumed that the disinfection standard will be a total coliform MPN of 2.2 per 100 mL. The type and design of the UV disinfection system would be as described previously in **Section 6.3.1.1.** Effluent from the Title 22 sand filters earmarked for surface water discharge would flow to the UV system dedicated to surface water discharge.

Chlorine Disinfection

As described previously, chlorine disinfection is preferred for water recycling applications. A chlorine disinfection system would be provided for the Title 22 recycled water sidestream. Effluent from the Title 22 sand filters would flow to the chlorine disinfection system. The design of the chlorine disinfection system would be as described in **Section 6.3.1.1** for Alternative 1.

Recycled Water Pump Station

A recycled water pump station would be required for recycled water distribution. The size and type of pumps required would be determined based on the hydraulic flow and storage characteristics and requirements of the recycled water distribution system.

Chemical Storage and Handling Facilities

The chlorine disinfection system would require sodium hypochlorite, which would be stored in an 8,000-gallon polyethylene tank. Duty and standby metering pumps would be provided for supply of sodium hypochlorite to the chlorine contact tank. It is expected that the metering pumps would be located indoors within an area for designed for spill containment. The chemical storage would be located outdoors in another spill containment structure. A canopy would be provided to shade the storage tank.

6.3.2.2. Non-economic Advantages/Disadvantages

The non-economic advantages and disadvantages of the oxidation ditch system are summarized in **Table 6-5**.

Table 6-5: Non-economic Advantages and Disadvantages of the Oxidation Ditch

Advantages	Disadvantages
Smaller footprint.	Clarification stability susceptible to activated sludge process upsets.
High effluent quality.	Dedicated sludge handling facilities required.
Achieves nitrogen removal.	
Nonproprietary design allows competitive bidding.	

6.3.3. Process Alternative 3—Immersed Membrane Bioreactor

MBRs are state-of-the-art treatment processes designed to treat wastewater using the same principles as conventional activated sludge processes. That common driving principle is the conversion of soluble waste into biomass. The difference is the rate at which these reactions are occurring and also the method by which the separation of solids occurs. Compared to conventional activated sludge, which relies on a clarifier for gravitational separation of solids, MBRs utilize membrane technology to physically separate the solids. The result is a more uniform effluent quality and enhanced biological treatment performance because of the higher microorganism concentrations not previously possible with activated sludge.

Using membrane technology, high-quality effluent is produced that can be readily applied to a variety of discharge reuse alternatives. Discharge alternatives for consideration using this process include the percolation bed, recycled water, and river discharge.

MBRs consolidate many of the unit processes required in a conventional activated sludge design. Fine screening is required to protect the immersed membranes. In addition, if grit is found to be present in the wastewater, grit removal may be necessary. However, the process combines oxidation, clarification, and filtration into one step. A bioreactor with separate anoxic and aerobic cells provides the environment necessary for BOD removal, nitrification, and denitrification processes to occur. As a result of the high concentrations of microorganisms that synthesize the waste, uptake rates are significantly increased.

Membrane modules immersed in the aerobic portion of the process tank combine the functions of the clarifier and tertiary filtration processes in a single step. The membranes are typically classified as microfiltration or ultrafiltration and have nominal pores with a diameter of 0.1 to 0.4 μm. Filtration by this method produces an effluent with very low solids concentration. After filtration, the membrane effluent, called permeate, is ready for disinfection.

Depending on the discharge point, the permeate is disinfected with either UV or sodium hypochlorite. For discharge to the river, UV is well-suited since a very low solids concentration minimizes shielding of bacteria. As a result, UV disinfection provides efficient and consistent microbial inactivation without increased risk of chemical DBP formation. In the case of discharge for recycled water, chlorination is preferred over UV since maintaining a chlorine residual in recycled water distribution systems is desirable.

Waste sludge and solids residuals would be disposed of in one of the existing facultative treatment ponds, which would be converted to an SSB. At the SSB, the solids residuals are concentrated, compacted, and further stabilized. SSBs are designed with sufficient capacity to provide long-term stabilization of the sludge, with some facilities operating in excess of 10 years without requiring removal of accumulated sludge. Alternatively, the solids could be dewatered and hauled to a sludge disposal site.

The MBR system preliminary design incorporates several effluent management alternatives. A process train required for discharge to percolation beds, surface discharge and recycled water is shown in **Figure 6-5**.

6.3.3.1. Facility Design

The following MBR facility design is based on a preliminary estimate of flows presented in **Section 4**. Facility design of the MBR alternative was completed on a preliminary level. A conceptual site layout is included in **Figure 6-6** showing major facility sizes and locations for treating 5.0 MGD ADF. Future additional facilities are also shown to illustrate expandability to the proposed new buildout flow of 7.5 MGD ADF. Unit process summaries for major processes are included in **Table 6-6**.

Table 6-6: Unit Process Summary for the Immersed Membrane Bioreactor

Unit Process [a]	Design Criteria [b]	Size (ft) [c]	Total units at ADF	
			5.0 MGD	7.5 MGD
Flow meter	Range 0-28 mgd, 0.25 fps min., 33 fps max.	16 inch Ø	1	1
Fine screen	Rotary drum screen 1-3 mm perforations	20L x 2.5W	1	2
Grit removal	Vortex type	12 Ø	1	2
Anoxic basin	4 hour HDT	43L x 30W x 22D	4	6
Aeration basin	10 hour HDT	110L x 30W x 21D	4	6
Immersed membrane bioreactor	10.4 gfd @ ADF; 18.1 gfd @ PHF 3.6 hour HDT 6:1 recycle ratio	63L x 10W x 9D	4	5
UV disinfection	Total coliform MPN 2.2 per 100 mL sample (surface discharge)	TBD	1 channel	1 channel
Chlorination	Contact time = 120 minutes @ 5.5 mgd	660L x 10W x 10D	2	3
Sludge stabilization basin	15 lb MLVSS/ 1000 sq-ft/ d	38 MG	1	1

[a] Design is based on ADF.
[b] Minimum design freeboard is 2 ft.
[c] Length, width, depth, height, and diameter are denoted as L, W, D, H, and Ø respectively.

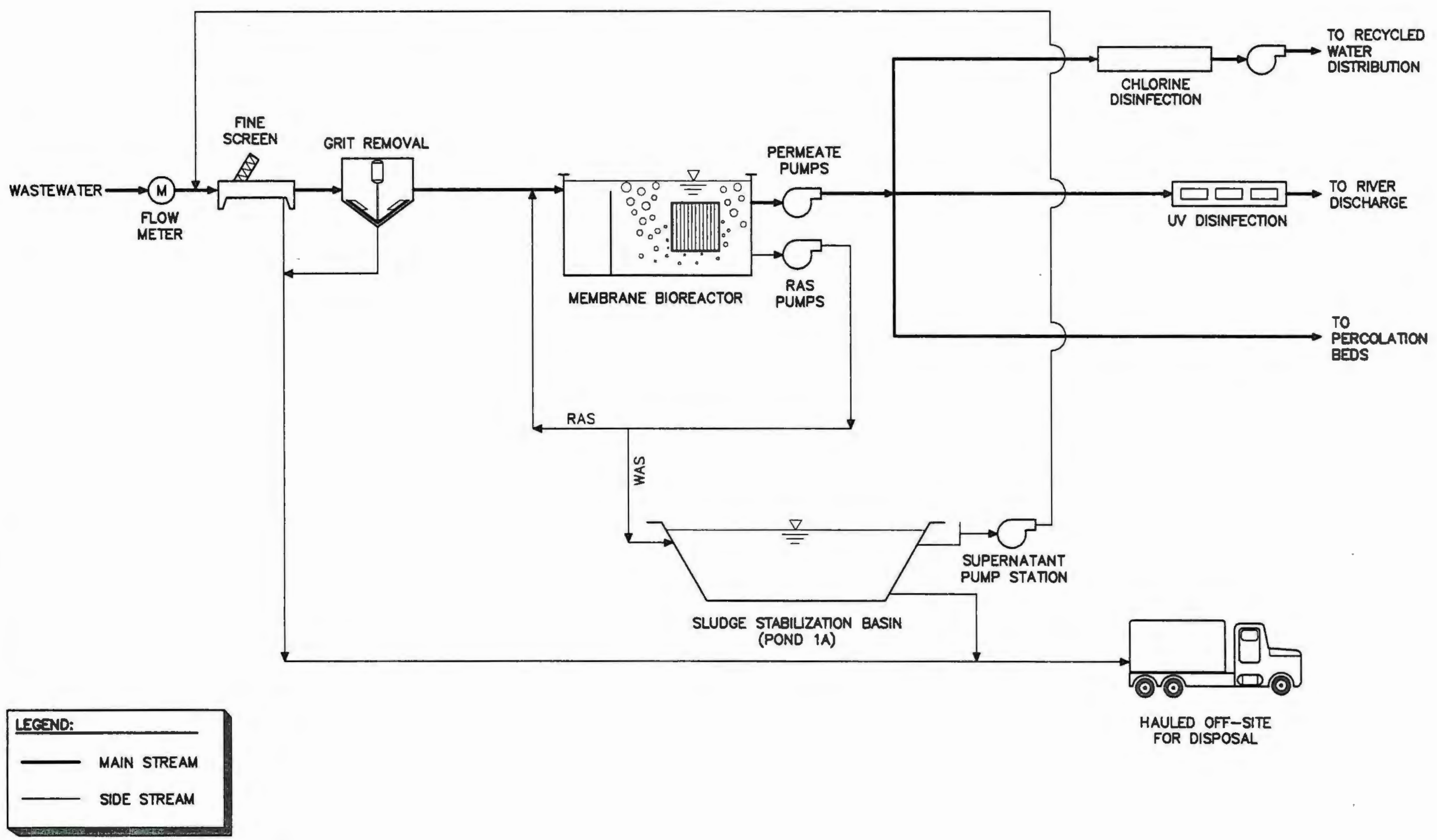

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Figure 6-5

City of Hollister Long-Term Wastewater Management Program

Immersed Membrane Bioreactor Process Flow Diagram with Reclamation

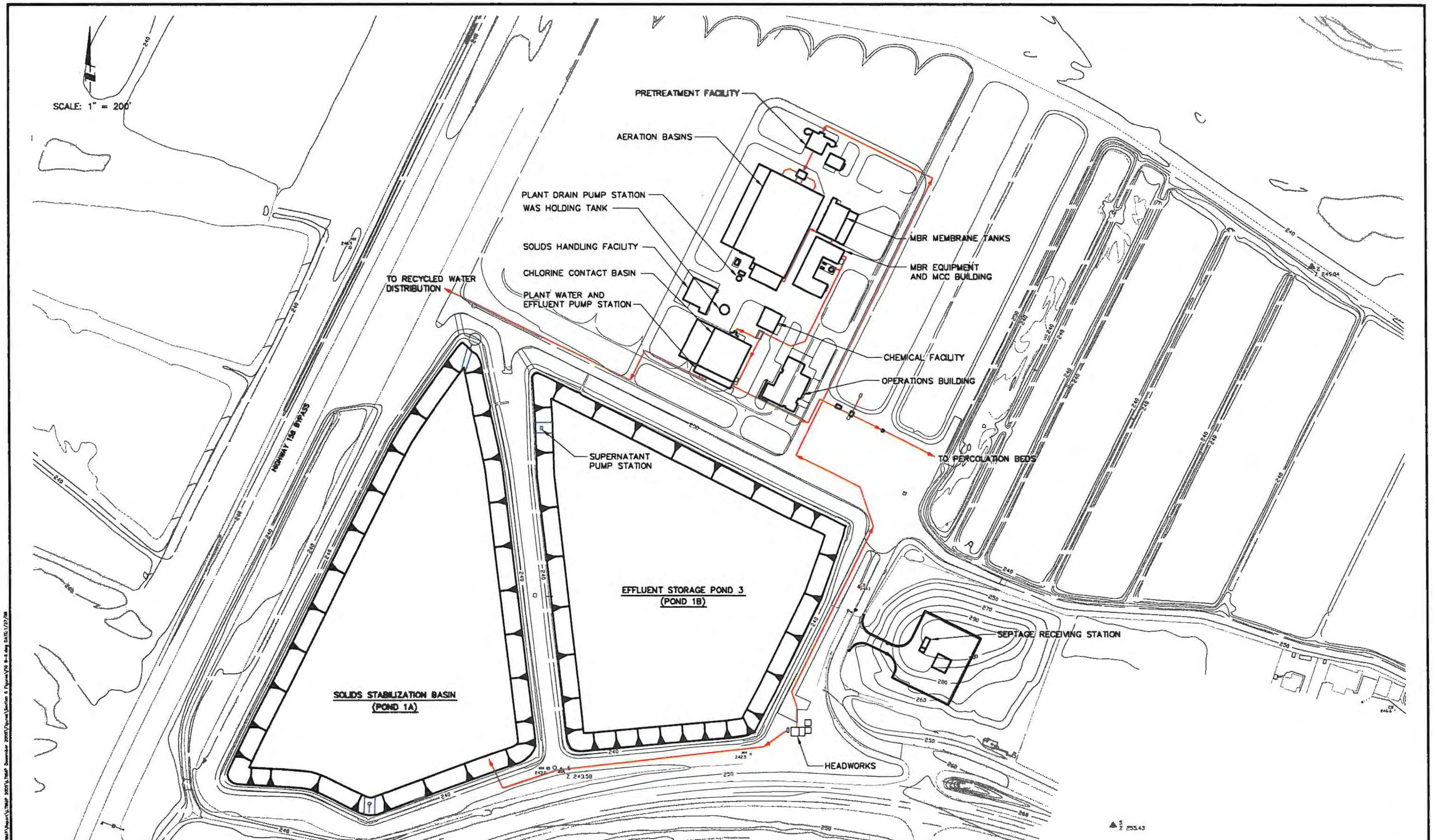

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Figure 6-6
City of Hollister Long-Term Wastewater Management Program
Immersed Membrane Bioreactor Conceptual Site Layout

Headworks

The existing headworks would be incorporated into the MBR design as detailed previously in **Section 6.3.1.1**.

Influent Pump Station

In order to minimize excavation required at the location selected for the MBR basins, the influent pump station (incorporated in the existing headworks) would be required to lift the wastewater to the high water level in the pretreatment facilities. Once pumped to this elevation, the remainder of the flow through the biological processes would be by gravity. The influent pump station has a high level overflow that diverts wastewater to an equalization basin (Pond 1B) in the event the pump station fails or cannot match the influent flow. The pump station is designed to handle the design peak hour flow. Space has been provided for addition of future pumps for expansion to the future buildout peak hour flow.

Pretreatment

The pretreatment facilities consist of screening, grit removal and flow distribution. All wastewater flows into a common rectangular channel at the beginning of the pretreatment facility. A flow-splitting structure allows the flow to be split. Flow is split between two rotary drum screens. Provisions are made for the addition of a third screen in the future.

The rotary drum screen is a horizontal fine screen. This type of screen utilizes a perforated cylinder as the screen. MBR manufacturers recommend using perforations between 1 to 3 mm in diameter. The cylinder is mounted horizontally and is equipped with an inlet distribution weir. Screenings are captured inside the screen and are directed out the end of the cylinder. The advantage of using this type of screen is that the screening capture rate is very high. This is important for MBR systems since screenings can accumulate within the membrane fibers and cause physical damage to the membranes. Another advantage is that the screen is enclosed for odor control.

The grit removal facilities are located after the screens. Grit removal is necessary for MBR systems to prevent excess wear on the membranes for grit. A vortex type grit chamber would be designed to separate the grit from the screened wastewater. The grit would be pumped to a grit classifier to remove organics from the inert grit and to dewater the grit. The grit classifier and grit bin would be housed in a building to contain odors and minimize vector attraction.

All pretreatment channels, screening and grit facilities are enclosed to contain foul odors. A blower and a biofilter scrub foul air for odor removal. The blower continuously pulls air from the headspace in the enclosed facility. This maintains a negative pressure in the structure so that air cannot escape from the facility. The blower discharges into an odor control biofilter. The biofilter can be a compost design or a packaged synthetic media design.

Immersed Membrane Bioreactor (MBR)

The MBR system combines a suspended growth biological reactor with membrane filtration (microfiltration or ultrafiltration). Each MBR process train will consist of an anoxic zone for denitrification, an aeration zone for soluble BOD reduction and nitrification, and a membrane filtration zone for solids removal. Four MBR trains would be provided, each sized for an ADF of 1.25 MGD. The MBR will typically produce an effluent with BOD and TSS levels of less than 1 mg/L, and a turbidity of less than 0.1 NTU. The components of the MBR are described below.

Anoxic Zone: The first stage of an MBR is the anoxic zone. Main basin domestic wastewater flows from the pretreatment facility to a covered distribution channel running along the four anoxic zones. Wastewater is distributed into the four anoxic tanks through weir gates in the channel. The anoxic zone in each process train would be approximately 43 ft by 30 ft with a liquid depth of approximately 22 ft. The

HRT would be approximately four hours at ADF. The anoxic zones are equipped with mechanical mixers. From the anoxic zones, the wastewater flows to the aeration tanks.

Aeration Zone: Each aeration tank would be approximately 110 ft by 30 ft with a liquid depth of approximately 21 ft. The HRT would be approximately 10 hours at ADF. The aeration tanks are equipped with fine bubble diffusers for mixing and oxygen transfer.

Membranes: The membranes are located in a separate membrane basin. Four membrane tanks are proposed for the 5.0 mgd plant. Membrane cassettes are immersed in each basin; each cassette contains numerous membrane elements. A membrane element consists of a bundle of hollow microfiltration or ultrafiltration fibers or sheets, with a typical nominal pore size of approximately 0.1 to 0.4 microns.

A vacuum is applied to the module headers to draw the wastewater from the process tank through the membrane. Wastewater flows through the hollow fibers to a permeate pump. The permeate pump transfers the wastewater to the disinfection facilities or to the seasonal storage reservoir.

Mixed liquor from the membrane zone is continuously recycled back to the anoxic zone by a recycle pump in each membrane tank. This oxidized and nitrified recycle stream is blended with raw sewage (carbon source) to allow denitrification to occur in the anoxic zone. Periodically, a waste sludge pump located in each membrane zone pumps mixed liquor to the SSBs.

Air is typically fed to the underside of the membranes to prevent solids from binding on the surface of the membranes. One backwash storage tank would be provided for periodic backwash of the membranes, with a storage capacity of approximately 6,000 gallons. The backwash tank is filled with permeate from the MBRs. Sodium hypochlorite is periodically added to the backwash for control of bio-growth on the membrane strands. It is expected that the chlorine demand in the mixed liquor will consume any chlorine introduced by the backwash cycle.

UV Disinfection

A UV channel would be provided for wastewater effluent management through surface water discharge. The UV disinfection process would be as described in **Section 6.3.1.1** for Alternative 1.

Chlorine Disinfection

A chlorine contact basin would be provided to disinfect tertiary-treated wastewater for Title 22 recycled water discharge. The chlorine contact tank would be designed to meet Title 22 disinfected tertiary recycled water requirements. The disinfection system design would be as described in **Section 6.3.1.1** for Alternative 1.

Recycled Water Pump Station

A recycled water pump station would be required for recycled water distribution. The size and type of pumps required would be determined based on the hydraulic flow and storage characteristics and requirements of the recycled water distribution system.

Chemical Storage and Handling Facilities

The chlorine disinfection system would require sodium hypochlorite, which would be stored in an 8,000-gallon polyethylene tank. Duty and standby metering pumps would be provided for supply of sodium hypochlorite to the chlorine contact tank. It is expected that the metering pumps would be located indoors within an area for designed for spill containment. The chemical storage would be located outdoors in another spill containment structure. A canopy would be provided to shade the storage tank.

Sludge Stabilization Basin

Existing Primary Pond 1A would be converted into an SSB. WAS would be collected from the MBRs for further stabilization. The storage basins would have enough capacity to provide long-term storage. Based on the size of existing Pond 1A, it is expected that sludge storage capacity would exceed 10 years.

Solids Dewatering

As an option waste sludge from the clarifiers could be mechanically dewatered. The dewatered sludge would be taken to a landfill for disposal. Note that this sludge would not meet Class B requirements and could not be eligible for beneficial reuse without further treatment. At a minimum a facility including a sludge storage tank, sludge feed pump, polymer feed system and a two-meter belt filter press would be required for the initial construction. Provisions for adding a second belt press would be made. The belt press and ancillary equipment would be housed in building to protect the equipment from weather and to contain any odors. Dewatered sludge from the belt filter press would be conveyed via a screw conveyor to a waste container or truck trailer.

Flow Equalization and Storage

Ponds 1B, 3A, and 3B would be converted for storage of treated effluent. Accumulated solids in the ponds would be removed and inlet/outlet structures would be added.

6.3.3.2. Non-economic Advantages/Disadvantages

The non-economic advantages and disadvantages of the MBR system are summarized in **Table 6-7.**

Table 6-7: Non-economic Advantages and Disadvantages of the MBR

Advantages	Disadvantages
Small footprint.	Requires fine screening.
Extremely high quality effluent; state-of-the-art treatment.	Limited equipment manufacturers.
Achieves nitrogen removal.	Relatively "new" process.
Combines clarification and filtration with oxidation process.	Requires dedicated sludge handling facilities.
High MLSS provides resistance to loading shocks.	
Certified for CCR Title 22 use by CA DHS.	
Significantly reduces disinfection requirements.	
Provides pretreatment for TDS removal by reverse osmosis.	

6.3.4. Process Alternative 4 - Sequencing Batch Reactor

Sequencing Batch Reactors (SBRs) are a variation of the activated sludge process capable of producing high quality effluent. The principal difference between SBRs and oxidation ditches are that stabilization and solids separation are sequentially accomplished in a single reactor operating in batch mode as opposed to an individual aeration basin and clarifier, which are designed for continuous flow.

After the wastewater flows through the headworks and is screened, it is routed to the SBR tank. The SBR tank is a single concrete reactor where five different steps are carried out. The first step is the fill mode, where wastewater is introduced at 25%-100% of the design volume. When the set-point volume is reached, flow to the tank is stopped and diverted to a parallel SBR tank to allow the WWTP to continuously receive and treat the wastewater. Alternate phases aeration and mixing (without aeration) follows as the second step. The aeration phase promote soluble BOD removal and nitrification. The mixing or anoxic phase promotes denitrification. Once completed, the process switches to settling mode, the third step, which provides solids separation. When the solids have settled, the clarified portion is decanted (step four) and disinfected prior to discharge, while the solids are wasted (step five).

The clarified effluent continues down the process train undergoing additional treatment depending on the discharge capacity and/or discharge point. For direct discharge to the percolation beds, no disinfection is required of the clarified effluent prior to discharge. If the discharge point is surface-discharge to the river, then the clarified effluent must first be filtered to meet possible turbidity controls on the river and then disinfected with UV light. UV disinfection is preferred for river discharge since it avoids chemical addition, such as with chlorination, which increases the risk for DBP formation. For discharge of recycled water, tertiary filtration would be required as an added process prior to disinfection by sodium hypochlorite.

WAS and solids residuals would be disposed of in one of the existing facultative treatment ponds, which would be converted to an SSB. At the SSB, the solids residuals would be concentrated, compacted, and further stabilized. SSBs are designed with sufficient capacity to provide long-term stabilization of the sludge, with some facilities operating up to 10 years without requiring removal of accumulated sludge. Alternatively, the solids could be dewatered and hauled to a sludge disposal site.

6.3.4.1. Facility Design

Facility design of this WWTP alternative was completed on a preliminary level. A process flow diagram illustrating the proposed treatment train is shown in **Figure 6-7**. Unit process summaries for major processes are included in a conceptual site layout is included in **Figure 6-8** showing major facility sizes and locations for treating 5.0 MGD ADF. Future additional facilities are also shown to illustrate expandability to the proposed new buildout flow of 7.5 MGD ADF. Unit process summaries for major processes are included in **Table 6-8.**

Table 6-8: Unit Process Summary for the Sequencing Batch Reactor

Unit Process [a]	Design Criteria [b]	Size (ft) [c]	ADF	
			5.0 MGD	7.5 MGD
Flow meter	Range 0-28 mgd, 0.25 fps min., 33 fps max.	16 inch ∅	1	1
Fine screen	Inclined rotary in-channel type 0.25-inch slot width	6 ∅	1	2
Grit removal	Vortex type	12 ∅	1	1
SBR Basins	6 cycles/day 1.45 days HDT 16.3 days SRT	100L x 100W x 19.5D	5	7
Tertiary Filtration	Average turbidity < 2 NTU 2.5 gpm/ft^2 at ADF with 1 cell out of service, 5.0 gpm/ft^2 at PHF	16.7L x 16.7W	6	8
UV disinfection	Total coliform MPN 2.2 per 100 mL sample (surface discharge)	TBD	1 channel	2 channels
Chlorination	Contact time = 120 minutes @ 5.5 mgd	470L x 12W x 8D	1	2
Sludge stabilization basin	15 lb VSS/10^3 ft^2/d	38 MG	1	1

[a] Design is based on ADF.
[b] Minimum design freeboard is 2 ft.
[c] Length, width, depth, height, and diameter are denoted as L, W, D, H, and ∅ respectively.

Headworks

The design of the headworks would utilize the same approach detailed previously in **Section 6.3.1.1**.

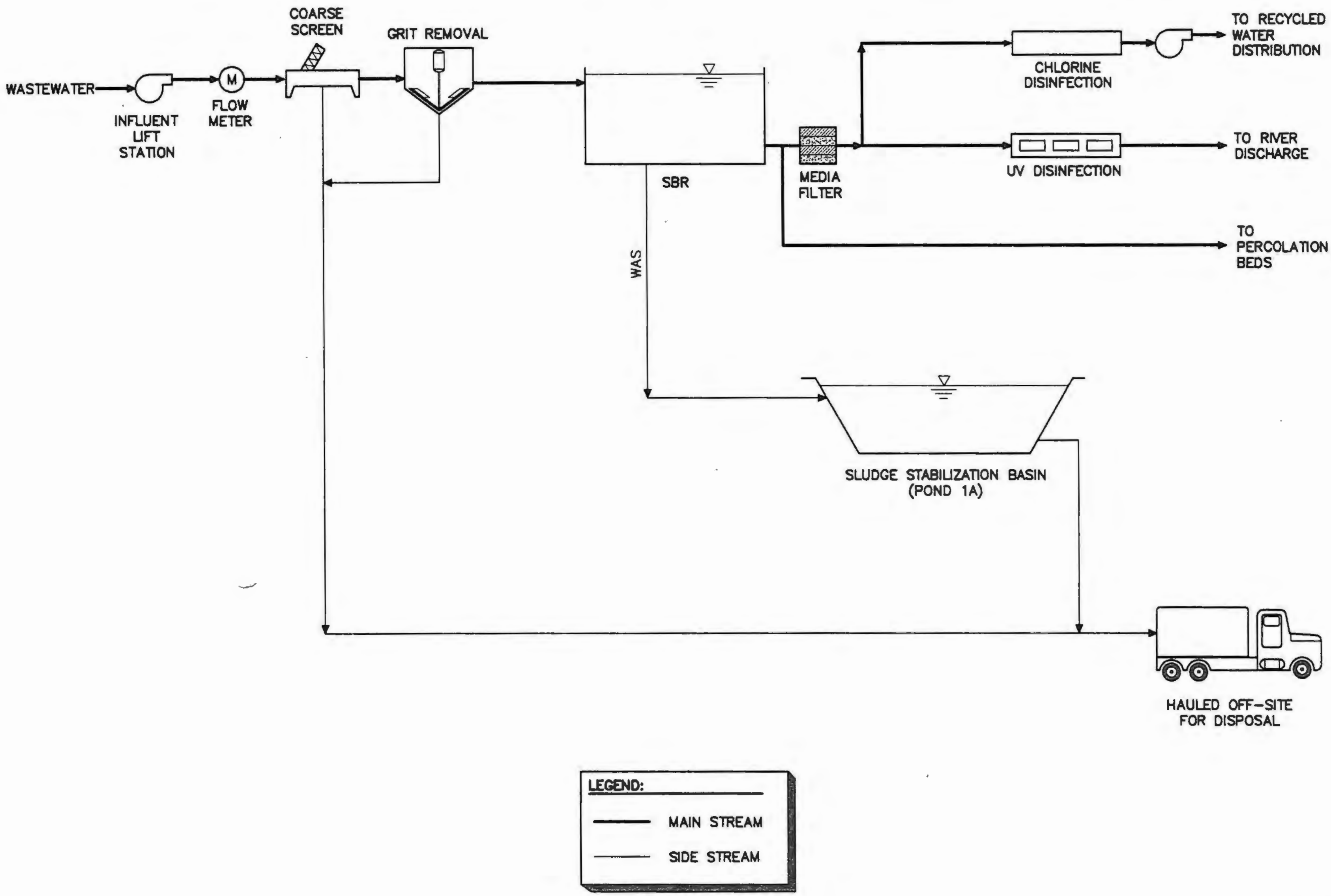

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Figure 6-7
City of Hollister Long-Term Wastewater Management Program
SBR Process Flow Diagram

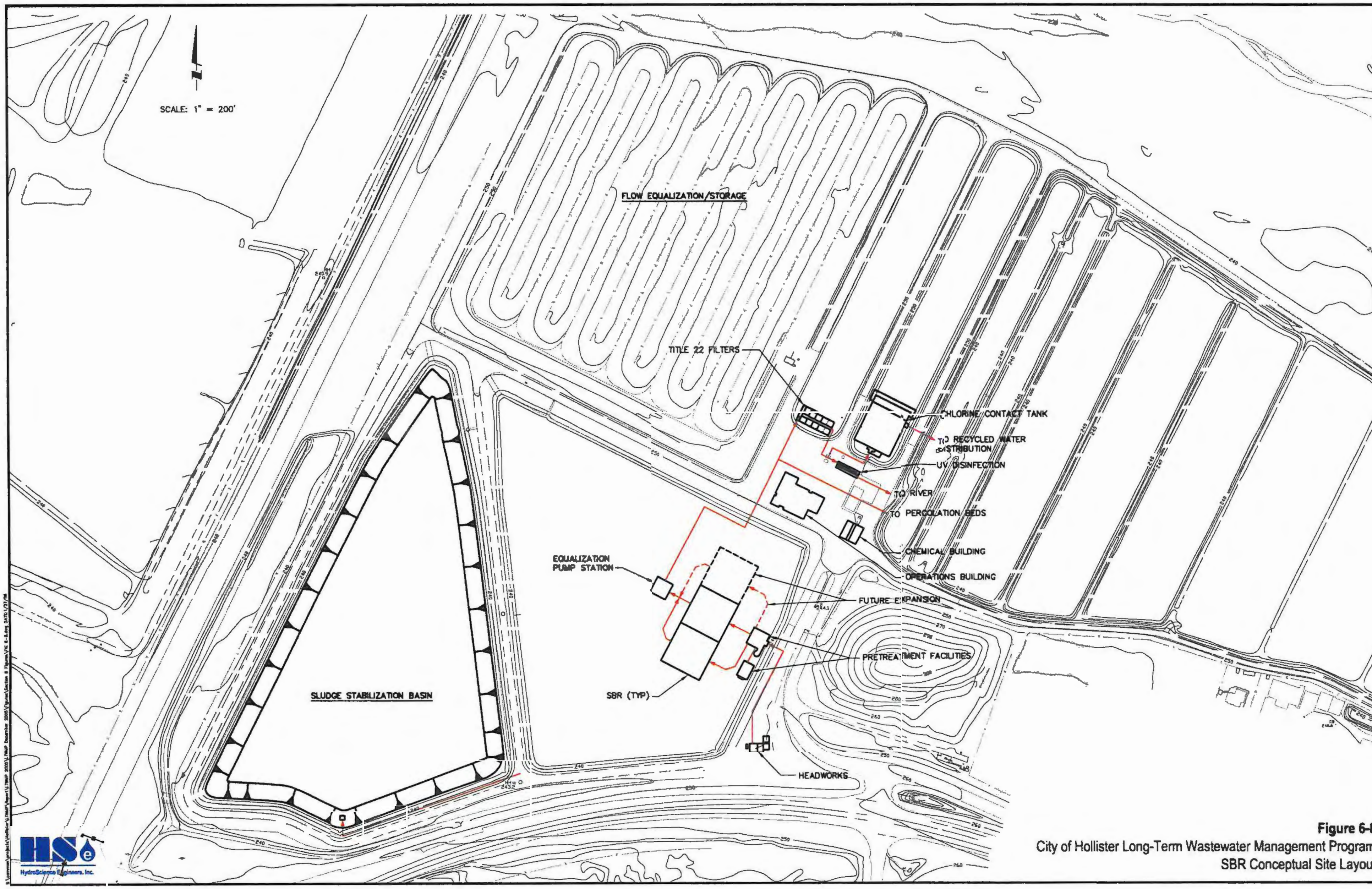


Figure 6-8
City of Hollister Long-Term Wastewater Management Program
SBR Conceptual Site Layout

Influent Pump Station

In order to minimize excavation required at the location selected for the SBR basins, the influent pump station (incorporated in the existing headworks) would be required to lift the wastewater to the high water level in the pretreatment facilities. Once pumped to this elevation, the remainder of the flow through the biological processes would be by gravity. The influent pump station has a high level overflow that diverts wastewater to an equalization basin (Pond 1B) in the event the pump station fails or cannot match the influent flow. The pump station is designed to handle the design peak hour flow. Space has been provided for addition of future pumps for expansion to the future buildout peak hour flow.

Pretreatment

The pretreatment facilities consist of screening, grit removal and flow distribution. All wastewater flows into a common rectangular channel at the beginning of the pretreatment facility. A flow-splitting structure allows the flow to be split to two identical channels. One channel houses a self-cleaning fine screen. The second channel is a bypass channel and contains a manual bar screen. Under normal operation, all wastewater flows through the self-cleaning coarse screen. However, a weir allows wastewater to either overflow or be diverted to the bypass channel, in the event the self-cleaning screen fails or is down for maintenance.

The self-cleaning screen is an inclined in-channel rotary screen. This type of screen utilizes a slotted or perforated cylinder as the screen. The cylinder is mounted in the rectangular channel at a 45-degree angle and a helical screw/scraper conveys solids up the cylinder into a dewatering section and then into a holding bin. The advantage of using this type of screen is that the screening, washing and compacting of the screened material is accomplished in one unit. Another advantage is that the top portion of the screen (above the channel) can be enclosed for odor control, as well as the solids discharge shaft to the screenings bin.

Following screening, the channel allows future addition of grit removal. Grit removal would not necessarily be required for the SBR alternative. If selected, a vortex type grit chamber would be designed to separate the grit from the screened wastewater. The grit would be pumped to a grit classifier to remove organics from the inert grit and to dewater the grit. The grit classifier and grit bin would be housed in a building to contain odors and minimize vector attraction.

All pretreatment channels, screening and grit facilities are enclosed to contain foul odors. A blower and a biofilter scrub foul air for odor removal. The blower continuously pulls air from the headspace in the enclosed facility. This maintains a negative pressure in the structure so that air cannot escape from the facility. The blower discharges into an odor control biofilter. The biofilter can be a compost design or a packaged synthetic media design.

Sequencing Batch Reactor

The secondary treatment equipment would be installed on the site of the high rate treatment ponds, Pond 2. That area is at a higher elevation than the influent pump station, therefore the wastewater flow would be pumped to the headworks. The site for the SBR would be graded so that it is situated at a lower elevation than the headworks, so that the wastewater would flow by gravity to the SBR.

The SBR system would consist of square concrete basins with a series of aeration headers and diffuser assemblies. Five separate SBR basins would be provided for flexibility for O&M of the system over a wide range of flows. Each basin would be approximately 100 ft wide by 100 ft long by 19.5 ft deep and have a volume of approximately 1.5 MG. Space would be designated for additional SBR basins in the future to meet buildout flows.

From the SBR basins, the process streams would be combined and flow to a wet well to pump water to UV disinfection for percolation or filters for reclamation or river discharge. While, excess sludge would be wasted to the SSBs for additional stabilization.

Title 22 Media Filtration

The design of the media filters would utilize the same approach detailed previously in **Section 6.3.1.1.** However, it is expected that media filtration would be sized for both surface water discharge and recycled water production.

UV Disinfection

For surface water discharge, it is assumed that the disinfection standard will be a total coliform MPN of 2.2 per 100 mL. The type and design of the UV disinfection system would be as described previously in **Section 6.3.1.1.**

Chemical Storage and Handling Facilities

The chlorine disinfection system will require sodium hypochlorite, which would be stored in an 8,000-gallon polyethylene tank. Duty and standby metering pumps would be provided for supply of sodium hypochlorite to the chlorine contact tank. It is expected that the metering pumps and the storage tank would be located outdoors within a bermed area for spill containment. A canopy would be provided to shade the pumps and storage tank.

Sludge Stabilization Basin

Existing Primary Pond 1A would be converted into an SSB. WAS would be collected from the MBRs for further stabilization. The storage basins would have enough capacity to provide long-term storage. Based on the size of existing Pond 1A, it is expected that sludge storage capacity would exceed 10 years.

Solids Dewatering

As an option waste sludge from the clarifiers could be mechanically dewatered. The dewatered sludge would be taken to a landfill for disposal. Note that this sludge would not meet Class B requirements and could not be eligible for beneficial reuse without further treatment. At a minimum a facility including a sludge storage tank, sludge feed pump, polymer feed system and a two-meter belt filter press would be required for the initial construction. Provisions for adding a second belt press would be made. The belt press and ancillary equipment would be housed in building to protect the equipment from weather and to contain any odors. Dewatered sludge from the belt filter press would be conveyed via a screw conveyor to a waste container or truck trailer.

Flow Equalization and Storage

Ponds 1B, 3A, and 3B would be converted for storage of treated effluent. Accumulated solids in the digesters would be removed and inlet/outlet structures would be added.

6.3.4.2. Non-economic Advantages/Disadvantages

The non-economic advantages and disadvantages of the sequencing batch reactor system are summarized in **Table 6-9.**

Table 6-9: Non-economic Advantages and Disadvantages of the Sequencing Batch Reactor

Advantages	Disadvantages
Equalization, biological treatment, clarification can be achieved in a single reactor.	High level of sophistication is required for timing units and control compared to other alternatives.
Operating flexibility and control.	Higher level of maintenance associated with greater sophisticated controls, automated switches, and automated valves.

Advantages	Disadvantages
Minimal footprint.	Tendency to develop algae growth due to the longer retention time in each basin.
Potential cost savings by eliminating clarifiers and other equipment.	Susceptible to public nuisance problems when basins are not fully loaded.
Capable of producing secondary-treated wastewater.	Potential of discharging floating or settling sludge during the draw or decant phase.
	Potential plugging of aeration devices during selected operating cycles.
	Potential requirement for equalization after the SBR due to batch operation.
	Batch solids wasting requires immediate attention to solids handling and disposal.
	Increased power costs due to increased mixing requirements.
	Unable to achieve nitrogen removal without adding treatment processes.

6.4. Wastewater Alternatives Estimated Costs

Capital and annual cost estimates were prepared for the LTWMP to provide comparative order of magnitude costs for upgrading the existing DWTP into the treatment alternatives considered at a capacity of 5.0 MGD ADF. This estimate, summarized in **Table 6-10**, was prepared in accordance with the guidelines of the American Association of Cost Engineers (AACE). According to the definitions of AACE, the order of magnitude estimate is defined as an approximate estimate made without detailed engineering data. It is normally expected that an estimate of this type would be accurate within +50% or -30%. These percentages should be viewed as statistical confidence limits, and should not be confused with contingencies.

The cost estimates shown, and any resulting conclusions on project financial or economic feasibility or funding requirements, have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project and resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, continuity of personnel and engineering, and other variable factors. As a result, the final project costs will vary from estimates presented here. Because of these factors, project feasibility, benefit/cost ratios, risks, and funding needs must be carefully reviewed prior to making specific financial decisions or establishing project budgets to help ensure project evaluation and adequate funding.

Table 6-10: Order of Magnitude Cost Estimate on DWTP Upgrade Alternatives (5.0 MGD)

Description	Extended Aeration	Oxidation Ditch	Membrane Bioreactor	Sequencing Batch Reactor
	2005 Costs in x1,000 of dollars			
Paving and grading	$2,722	$2,722	$2,722	$2,722
Demolition	$325	$325	$325	$325
Yard Piping	$3,070	$3,070	$3,070	$3,070
Pretreatment Facilities	$905	$905	$905	$905
Septic Receiving Station	$241	$241	$241	$241
Extended Aeration Equipment	$4,720	--	--	--
Oxidation Ditch Equipment	--	$8,368	--	--
MBR Equipment	--	--	$14,422	--
SBR Equipment	--	--	--	$6,390
Secondary Clarifier	$2,760	$2,760	--	$2,760

Description	Extended Aeration	Oxidation Ditch	Membrane Bioreactor	Sequencing Batch Reactor
Title 22 Filtration	$4,895	$4,895	--	$4,895
Chlorine Contact Basin	$1,621	$1,621	$1,621	$1,621
UV Disinfection	$1,845	$1,845	$1,845	$1,845
Solids Handling Facilities	$810	$810	$810	$810
Effluent Pump Station	$52	$52	$52	$52
Odor Control Biofilter	$172	$172	$172	$172
Solids Stabilization Basin	$158	$158	$158	$158
Vactor Truck Dump Facility	$32	$32	$32	$32
Chemical Handling Facilities	$299	$299	$299	$299
Plant Water Pump Station	$129	$129	$129	$129
Plant Drain Pump Station	$84	$84	$84	$84
Operations Building	$1,415	$1,415	$1,415	$1,415
Electrical/Instrumentation	$8,150	$7,899	$8,395	$8,250
General Conditions	$2,355	$2,355	$2,355	$2,355
Liquefaction Mitigation	$2,670	$2,670	$2,670	$2,670
Subtotal	$39,430	$42,827	$41,722	$41,200
Contingency 20%	$7,886	$8,565	$8,344	$8,240
Total Construction Costs	$47,316	$51,392	$50,066	$49,440

6.5. Recommended Treatment Design

Process Alternative 3, the Immersed Membrane Bioreactor (MBR), was recommended as the preferred long-term treatment upgrade for the DWTP. The MBR is a cost competitive alternative with a proven operational track record. All four process alternatives considered in this study are feasible designs able to produce high-quality effluent to meet the DWTP's LTWMP requirements and cost differentials are not significant. Where the advantages of the MBR alternative become distinguished over the other process alternatives is in the high quality effluent, reliability, compatibility with all effluent management alternatives and compactness of the process. The City of Hollister considered a number of factors in selecting the MBR alternative over the other alternatives. These factors included:

- Treatment process must produce Title 22 disinfected-tertiary recycled water
- Treatment process must meet strict nitrate limits anticipated
- Treatment process must be compatible with future dissolved solids removal

While all the alternatives could be designed to accommodate the first two factors, only the MBR process is readily compatible for a dissolved solids removal process such as reverse osmosis (RO). The other alternatives would require the addition of expensive microfiltration equipment as a pretreatment for an RO treatment system. The MBR includes microfiltration within its treatment process.

A more detailed description of the selected MBR treatment plant is presented in **Section 9.** The process flow diagram for the recommended WWTP is shown in **Figure 6-5.** A conceptual plan of the DWTP is contained in **Figure 6-6.**

SECTION 7

Evaluation of Interim Effluent Management Alternatives

7. Evaluation of Interim Effluent Management Alternatives

The City of Hollister has identified recycled water irrigation as its Long-Term Effluent Management Strategy. Until such time as the City can more definitively identify and develop a market for its recycled water, it must implement an interim effluent management strategy. This Section provides an evaluation of interim effluent management strategies. This analysis was conducted as a collaborative effort between the City, SBCWD and the County. These agencies developed alternative interim effluent management projects as well as, the selection criteria to analyze the projects under consideration, and recommended a Phase I Interim Effluent Management Project (Phase I Project), that would best meet their needs.

7.1. Project Background

The MOU is an agreement between the City, SBCWD and the County to collaborate in preparing the *Hollister Urban Area Water and Wastewater Master Plan* (Master Plan). This Master Plan is being prepared in order to anticipate the need for additional wastewater disposal and to identify future wastewater infrastructure improvements. The MOU also sets recycled water TDS objectives of 500 mg/L, but not greater than 700 mg/L, by the year 2015. Other items considered in the MOU include discharge issues, drinking water TDS objectives, and impacts to the environment, economy and local culture. The anticipated completion date for this Master Plan is in December 2006.

7.2. Section Organization

This Section will detail the evaluation and selection process that led to the selection of the Phase I Project.

7.3. Evaluation of Phase I Interim Effluent Management Projects

The City, the SBCWD and the County developed alternative effluent disposal options as well as selection criteria. A total of 18 effluent disposal options were evaluated. The disposal projects were reviewed as stand-alone projects or as a combination of projects from the following group of disposal options.

- Irrigation with recycled water
- Spray fields
- Storage via tanks and ponds
- Ocean Outfall/Discharge
- Surface water disposal
- Percolation
- Evaporation
- Export as construction water or to areas deficient in a water supply

The selection criteria utilized to select the near term project was based on the categories listed below.

- Date of Implementation
- RWQCB Compliance

- Construction & Operation Costs
- Area Requirements
- MOU Requirements
- Compliance with the *Hollister Urban Area Water & Wastewater Management Master Plan*

The above categories were further refined to form a selection matrix. The following sections provide detailed descriptions of the 18 effluent disposal options and as well as the selection matrix utilized to evaluate them.

7.3.1. Disposal Options & Criteria

The 18 effluent disposal options developed and evaluated are listed below:

- Operation with current Percolation/Storage Ponds
- 100% Percolation – New Ponds
- 100% Spray field – Reservoir
- 100% Spray field – Storage Tank
- 100% Spray fields and Irrigation
- Combination Spray field – new percolation ponds
- Constructed Wetlands
- 100% Subsurface Percolation/Leachfield – Community Infiltration
- Construction Water
- Deep Ground Injection
- RO and Brine Injection
- Export to Water Poor Areas
- Inject into Pajaro Pipeline
- Reclamation Plan Implementation
- Discharge to the San Benito River (Disposal/Restoration)
- Ocean Outfall/Discharge
- Storage Tanks
- Evaporation Tanks

Each of these options was evaluated on the basis of a series of selection criteria. The criteria presented below was used in this evaluation.

1. *Implementation Date - The date by which the disposal option can realistically be put into operation. Factors that influence the implementation date are the basic permitting and regulatory process, property acquisition, and the physical constraints associated with the time to construct.*
2. *Costs to Construct and Operate – Short-term and long-term costs associated with the options. The costs are calculated based upon the proposed 5 million gallon per day (MGD) facility. Costs are further divided into three sub-categories.*

a) *Capital Costs including engineering, permitting, property acquisition, and construction. Property acquisition costs are based on an average cost of $30,000.00 per acre.*

b) *Operations and maintenance including basic repairs and additional staff, but is exclusive of labor costs associated with the current City staff which it is assumed will be used for operations.*

c) *Annualized cost includes the costs for (a) and (b) combined for a 20-year period plus a factor for annual inflation and interest at 6.0%.*

3. *Area Requirements – Area required for a facility of the specified capacity including roads, parking areas, structures, and buffer zones. As a baseline for determining relative sizes of facilities using infiltration techniques, soil percolation rates were assumed to average approximately 4 minutes per inch. Observed and reported percolation rates in the area range from 0.65 to greater than 8 minutes per inch.*

4. *Compliance with the RWQCB Mandates – The various disposal options were discussed with RWQCB staff to get an idea of whether the implementation of the disposal option would lead to compliance with the mandate, current regulations, and RWQCB policy. Based on RWCB comments, options were evaluated on the basis of their potential to achieve compliance, not achieve compliance, or maybe achieve compliance.*

5. *Consistency with the Hollister Urban Area Water and Wastewater Management Master Plan - The City of Hollister (the City) is subject to a compliance order from the State of California Central Coast Regional Water Quality Control Board (RWQCB) that will require an upgrade to the City's existing treatment facility. Based on the actions of the RWQCB, the City has entered into an agreement with the San Benito County Water District (SBCWD) and the County of San Benito to develop a Hollister Urban Area Water and Wastewater Management Master Plan (Master Plan) to include a regional treated water management strategy. The Master Plan will contain a number of principles that define how treated water will be managed in the Hollister area* (Hollister, 2005).

From the above criterion a selection matrix was generated. A scale of 1- 10 (1 being the most favorable and 10 being the least favorable) was utilized to rank various effluent disposal options based upon the selection criteria prescribed in the MOU. These criteria are presented in **Table 7-1**. The implementation dates, costs, area requirements, and ability to achieve RWQCB compliance mandates were placed in a separate matrix or table for comparison purposes. These criteria are presented in **Table 7-2**.

The interim disposal options were also compared against a compliance issues discussed with the RWQCB. The compliance issues evaluated are listed in **Table 7-3**.

7.3.2. Recommended Effluent Management Strategy

The scoring process in **Table 7-1** ranks *100% Spray fields and Irrigation* as the highest ranked interim project, ***therefore, spray fields were recommended as the Phase I Interim Effluent Management Project***. The Phase I Project will be further developed in **Section 9**.

Table 7-1: City of Hollister Effluent Management MOU Selection Criterion

MANAGEMENT ALTERNATIVE	INCLUDES APPROPRIATE CONSIDERATION OF REGIONAL WASTEWATER DISCHARGE ISSUES (2.1.2)	INCLUDES CONSIDERATION OF FUTURE WASTEWATER DISPOSAL REQUIREMENTS (2.1.3)	PROVIDES FOR MAXIMUM REUSE OF WASTEWATER (2.1.3)	DOES NOT NEGATIVELY IMPACT DRINKING WATER SUPPLIES (2.1.3a)	DOES NOT NEGATIVELY IMPACT ADJACENT LAND USES (2.1.3a)	CONSISTENT WITH APPLICABLE GENERAL PLANS (2.1.3b)	CONSISTANT WITH QUANTITY, QUALITY, AND LEVEL OBJECTIVES FOR GROUNDWATER MGMT PLANS (2.1.3c)	COMPATABLE WITH APPROPRIATE BLENDING OF TREATED SURFACE WATER AND GROUNDWATER (2.1.4)	COMPATABLE WITH DIRECT USE OF URBAN WASTEWATER (2.1.4)	MINIMIZES NEGATIVE IMACTS ON LOCAL CULTURE, ECONOMY, AND ENVIRONMENT (2.1.7)	MEETS DISCHARGE REQUIREMENTS FOR TDS (<700 MG/L) (2.2.3)	COMPATABLE WITH CENTRALIZED TREATMENT (2.2.4)	COMPATABLE WITH AGRICULTURAL REUSE (2.2.7)	SCORE FOR COMPLIANCE WITH RECLAMATION PLAN	RANKING
Operate with Current Percolation/Storage Facilities	7	7	7	7	3	0	7	4	4	4	7	2	5	64	13
100% Percolation - New Ponds	2	2	4	3	4	0	2	2	2	3	4	2	3	33	5
100% Sprayfield - Reservoir	2	2	4	3	4	0	2	2	2	2	4	2	2	31	3
100% Sprayfield - Storage Tank	2	2	2	2	4	0	2	3	2	4	2	2	2	29	2
100% Sprayfields and Irrigation	2	2	4	2	3	0	2	2	2	2	2	2	2	27	1
Combination Sprayfield - new percolation ponds	2	2	4	3	4	0	2	2	2	3	4	2	2	32	4
Constructed Wetlands	7	5	7	7	7	0	7	7	7	7	7	2	7	77	15
100% Subsurface Percolation / Leachfield - Community Infiltration	2	4	7	3	2	0	2	2	4	2	4	2	7	41	8
Construction Water	5	5	4	3	2	0	4	7	3	2	3	4	7	49	10
Deep Ground Injection	4	5	3	5	2	0	4	7	7	3	3	2	7	52	11
R.O. and Brine Injection	4	5	3	2	2	0	4	7	7	2	2	2	7	47	9
Export to Water Poor Areas	3	2	2	2	2	0	3	7	2	3	2	2	7	37	6
Inject into Pajaro Pipeline	3	2	2	2	2	0	4	7	2	3	2	2	7	38	7
Reclamation Plan Implementation	4	5	3	4	2	0	3	4	2	3	4	4	3	41	8
Discharge to the San Benito River (Disposal/ Restoration)	3	3	5	5	2	0	4	7	7	4	3	2	4	49	10
Ocean Outfall/ Discharge	7	5	7	2	2	0	7	7	7	7	3	2	7	63	12
Storage Tanks	3	5	2	2	3	0	7	7	2	4	2	2	2	41	8
Evaporation Ponds	7	4	7	3	7	0	7	7	7	7	7	2	7	72	14

Notes:

1. Courtesy of the City of Hollister.

2. Scoring was performed by the City of Hollister, the San Benito County Water District, and San Benito County.

3. The numbers in parenthesis correspond to selected MOU Sections.

Table 7-2: City of Hollister Effluent Management Selection Criterion

MANAGEMENT ALTERNATIVE	IMPLEMENTATION DATE	APPROXIMATE CAPITAL COST - 5 MGD FACILITY (THOUSAND DOLLARS)	APPROXIMATE ANNUAL OPERATION COST - 5 MGD FACILITY (THOUSAND DOLLARS)	ESTIMATED ANNUALIZED COST OVER 20 YEARS - 5 MGD FACILITY (THOUSAND DOLLARS)	AREA REQUIRED FOR 5 MGD CAPACITY (ACRES)	ACHIEVES AND MAINTAINS RWQCB COMPLIANCE
Operate with Current Percolation/Storage Facilities	A = 2007	N/A		N/A	Current facilities not adequate.	NO
100% Percolation - New Ponds	A = 2007	B = $5-10 million	(3)	III	50	YES
100% Sprayfield - Reservoir	A = 2007	E = $20-25 million	(1)-(2)	V	1500	YES
100% Sprayfield - Storage Tank	B = 2010	F - $83	(1)-(2)	VI - $7.3	1500	YES
100% Sprayfields and Irrigation	B = 2010	E = $20-25 million	(1)	V	1500	YES
Combination Sprayfield - new percolation ponds	A = 2007	D = $15-20 million	(1)-(2)	V	500-1000	YES
Constructed Wetlands	C =2015	C = $10-15 million	(1)	III	70	NO(?)
100% Subsurface Percolation / Leachfield - Community Infiltration	A-B = 2007-2010	C = $10-15 million	(1)-(2)	III	50	YES
Construction Water	D = 2015+	E = $20-25 million	(1)	IV	0	MAYBE
Deep Ground Injection	C =2015	C = $10-15 million	(4) - $1.6	IV	20	MAYBE
R.O. and Brine Injection	D = 2015+	E = $20-25 million	(4) - $1.6	IV	20	YES
Export to Water Poor Areas	D = 2015+	?	(1)	?	?	YES
Inject into Pajaro Pipeline	C =2015	F - $26	(1)	V	70	YES
Reclamation Plan Implementation	C =2015	E = $20-25 million	(1)	V	1500	YES
Discharge to the San Benito River (Disposal/ Restoration)	C =2015	B = $5-10 million	(1)	II	5	MAYBE
Ocean Outfall/ Discharge	D = 2015+	F - $56	(4) - $0.2	V	150	NO
Storage Tanks	C =2015	F - $1852	(1)	VI - $161	175	MAYBE
Evaporation Ponds	A-B = 2007-2010	F - $89	(2)	VI - $7.7	2100	NO

Date Key	Cost Key	Operation Cost Key	Annualized Costs Key	Color Key
A - By 2007	N/A - Not Applicable	(1) - <$50K	I - <$100K	NO
B - By 2010	A - <$5 Million	(2) - $50K to $100K	II - $100K to $500K	CHANGES IN CONDITIONS MAY ALLOW PERMITTING
C - By 2015	B - $5 to 10 Million	(3) - $100K to $200K	III - $500K to $1 Million	PART OF A LARGER SOLUTION
D - After 2015	C - $10 to $15 Million	(4) - ≥ $200K[1]	IV - $1 Million to $2 Million	YES
	D - $15 to $20 Million	(1) - Approximate costs	V - $2 Million to $5 Million	
	E - $20 to $25 Million		VI - ≥ $5 Million[1]	
	F - ≥ $25 Million[1]		(1) - Approximate costs in millions of dollars	
	(1) - Approximate costs in millions of dollars			

Notes:

1. Courtesy of the City of Hollister.

2. Analysis was performed by the City of Hollister, the San Benito County Water District, and San Benito County.

3. Detailed information for the Compliance Column (last column in table) can be found in Table 7-3.

Table 7-3: City of Hollister Effluent Management Selection Criterion for Compliance Challenges

	MANAGEMENT ALTERNATIVE	ACHIEVES AND MAINTAINS RWQCB COMPLIANCE	COMPLIANCE HURDLES (Based on conversations with RWQCB staff)	Additional Comments
1	Operate with Current Percolation/Storage Facilities	NO	The current treatment and percolation facilities do not comply with the RWQCB's requirements, and are in violation. Additionally, the City of Hollister is under orders to discontinue disposal of municipal wastes at the City Industrial treatment facility.	
2	100% Percolation - New Ponds	YES	Generally acceptable, already used in the region, and is considered a preferred alternative by the RWQCB, requires an RWQCB waste discharge permit.	
3	100% Sprayfield - Reservoir	YES	Generally acceptable, already used in other areas, requires an RWQCB waste discharge permit.	
4	100% Sprayfield - Storage Tank	YES	Generally acceptable, currently proposed for other areas, requires an RWQCB waste discharge permit.	
5	100% Sprayfields and Irrigation	YES	Generally acceptable, already used in other areas, requires an RWQCB waste discharge permit.	
6	Combination Sprayfield - new percolation ponds	YES	Generally acceptable, already used in other areas, requires an RWQCB waste discharge permit.	
7	Constructed Wetlands	NOT NOW	Subject to permitting by the RWQCB, and possibly DFG, USFWS, and USACE. RWQCB does not consider this an acceptable option because water quality degrades due to evaporative concentration of TDS and nitrate wastes associated with large numbers of birds and other wildlife that are attracted to and inhabit the wetland.	Acceptable in other areas, so may be subject to change.
8	100% Subsurface Percolation / Leachfield - Community Infiltration Gallery	YES	Generally acceptable, already used in other areas, requires an RWQCB waste discharge permit.	
9	Construction Water	MAYBE	May require an RWQCB waste discharge permit, acceptability is restricted based on the proposed location for use.	This item is more applicable as a component of the solution rather than the solution due to the volume of product requiring disposal.
10	Deep Ground Injection	MAYBE	Acceptability is dependent on the compatibility between treated water and the zone into which the water is injected. Requires permitting from both the RWQCB and CONSRV.	
11	R.O. and Brine Injection	YES	Acceptable in principle, but dependent on the compatibility between treated water and the zone into which the water is injected. Requires permitting from both the RWQCB and CONSRV.	
12	Export to Water Poor Areas	YES	Generally acceptable, already used in other areas, may require an RWQCB waste discharge permit.	
13	Inject into future Pajaro Pipeline	MAYBE	Generally acceptable, may require an RWQCB waste discharge permit.	Pipeline has not yet been built
14	Reclamation Plan Implementation	YES	Generally acceptable, already used in the region, and is considered a preferred alternative by the RWQCB, some aspects require an RWQCB waste discharge permit.	
15	Discharge to the San Benito River (Disposal/ Restoration)	MAYBE	Subject to permitting by the RWQCB, and possibly DFG, USFWS, and USACE. Generally acceptable, already used in the region, and is considered a preferred alternative by the RWQCB.	There is strong opposition from downstream communities.
16	Ocean Outfall/ Discharge	NO	Subject to permitting by the RWQCB, and possibly DFG, USFWS, and the California Coastal Commission. RWQCB does not consider this an acceptable option because of water quality incompatibility issues between the treated water and the marine environment. Technically practical locations for ocean discharge in the region are in areas designated as environmentally sensitive or protected.	
17	Storage Tanks	MAYBE	Acceptability and permitting requirements are dependent on the eventual final use of the stored water.	Still need to ultimately dispose of the product, but it may work as a part of a larger solution
18	Evaporation Ponds	NO	Subject to permitting by the RWQCB, and possibly DFG, USFWS, and USACE. RWQCB does not consider this an acceptable option because water quality degrades due to evaporative concentration of TDS and nitrate wastes associated with large numbers of birds and other wildlife that are attracted to ponds of the size required.	

Notes:
1. Courtesy of the City of Hollister.
2. Analysis was performed by the City of Hollister, the San Benito County Water District, and San Benito County.

RWQCB - State of California Regional Water Quality Control Board, Ce
DFG- State of California Department of Fish and Game
USFWS - United States Fish and Wildlife Service
USACE - United States Army Corps of Engineers
TDS - Total Disolved Solids
CONSERV - State of California Department of Conservation

SECTION 8

Water Balance

8. Water Balance

This Section develops a water balance for the City of Hollister's LTWMP. The water balance is used to estimate the size of the seasonal storage reservoir that the City will need to construct to hold treated effluent produced by the DWTP during the wet winter months. The water balance also assists the City in identifying the number of acres of land that the City will have to acquire and use as spray fields for disposal of effluent during the dry summer months.

8.1. Background

It is the City's goal to maximize the reuse of treated effluent in the region. As discussed in **Section 7**, the City, the SBCWD and the County evaluated a wide range of effluent disposal options for the DWTP and recommended the development of spray fields for interim effluent disposal until such time as the City's Recycled Water Project (discussed in **Section 9**) could be more fully implemented to maximize the reuse of recycled water. Ultimately, the City would like to dispose of 100% of its effluent through irrigation reuse. Updating the City's Waste Discharge Requirements (WDR) permit through the RWQCB to permit the disposal of the effluent on spray fields (as well as recycled water irrigation fields) will require the City not to apply water at rates that exceed the agronomic demands of the irrigated vegetation.

The uptake of water by plants occurs through the evapotranspiration process. Evapotranspiration is the process whereby plants lose water through the combined processes of evaporation to the atmosphere and transpiration. Transpiration is the process of water loss from plants through stomata. Stomata are small openings found on the underside of leaves that are connected to vascular plant tissues. Transpiration is a passive process largely controlled by the humidity of the atmospheric and the moisture content of the soil. Of the transpired water passing through a plant typically only about 1 % is used in the growth process. Transpiration transports nutrients from the soil into the roots and carries them to the various cells of the plant. Evapotranspiration is limited to the growing season and the uptake of irrigation water by plants is further limited to those periods of time when there is insufficient soil moisture available to meet the water demands of the plants.

In addition, the RWQCB will generally not allow the application of recycled water to spray fields when saturated soil conditions exist that would result in potential co-mingling of treated effluent with rain run-off. Therefore, because of local meteorological conditions, plant physiology, and RWQCB permitting constraints, the disposal of effluent on spray fields can be assumed to be limited to the warmer and drier months in Northern California. Generally, these months run from about April until about October.

Because the City will only be able to dispose of its effluent on spray fields during the dry months, it must construct a seasonal storage reservoir to store its effluent during the wet season when it cannot dispose of water. The City must then construct sufficient spray fields to not only dispose of the effluent that it generates during the dry months, but it must also construct sufficient spray fields to also dispose of all of the water that has accumulated in its seasonal storage reservoir during the wet months. The ultimate operational strategy would therefore be to ensure that the City's storage reservoir is sufficiently empty at the end of the irrigation season to have sufficient storage capacity to store all of the effluent that will be generated by the City during the upcoming wet season. Operation of the spray fields and the storage reservoir therefore becomes essentially a balancing act between storing water during the wet season and disposing of water during the dry season. In order for the City to plan for the design of these storage and spray field facilities the City must first develop and understand this water balance under build-out conditions.

8.2. Water Balance

Water balance analyses were performed to determine the amount of seasonal storage required for the two phases of the LTWMP. The water balance assumes there will be between 0.5 – 2.0 MGD of disposal in the existing percolation beds located at the DWTP and management of the remainder of effluent by landscape or spray field irrigation. No expansion of the City's percolation beds is proposed. In Phase I (Interim Effluent Management Project through 2013) it is assumed that the City will dispose of the vast majority of its effluent by spray field irrigation of pasture grass. In Phase II (Recycled Water Project through 2023) it is assumed that the City has implemented its recycled water program and all of the City's effluent is disposed of through recycled water irrigation.

Water balances were prepared for the City's Phase I Interim Effluent Management Project (2013) and the City's Phase II Recycled Water Project (2023). The Phase I Interim Effluent Management Project will manage and dispose of the City's effluent on spray fields for approximately the first 5 years (from 2008 until 2013). This is an interim project until the City can more fully develop and implement its recycled water project. By 2023 the City will implement its Phase II Recycled Water Project that is anticipated to be a regional recycled water program.

8.2.1. Precipitation

The amount of precipitation influences the amount of water that the City will be able to dispose of on spray fields. In addition, rainfall will fall into the City's open seasonal storage reservoir and must be accounted for in the water balance. Monthly precipitation distributions for the Hollister project area were analyzed for four scenarios for the purpose of preparing the LTWMP water balances. The four rainfall scenarios evaluated were for a typical year, the 25-year return period rainfall year, the 50-year return period rainfall year, and the 100-year return period. Monthly rainfall distributions were calculated for each scenario. For the purposes of these statistical evaluations, monthly rainfall data from 1875 through 2004 was analyzed. Rainfall values prior to June 1995 were taken from the City of Hollister rain gage while data after 1995 was collected at the California Irrigation Management Information System (CIMIS) station at the SBCWD offices. The results of these precipitation probability analyses are summarized in **Table 8-1**. The most conservative data for the 100-Year Return Period were used in the LTWMP water balances.

8.2.2. Percolation

The City currently percolates treated effluent into the groundwater in 8 percolation beds at the DWTP on the east side of Highway 156 and 7 beds on the west side of the highway. Percolation rates vary significantly over the course of the year with significantly reduced percolation rates observed during the wet season when soil conditions are saturated and groundwater levels are high. **Table 8-2** summarizes combined monthly percolation rates observed by City staff for all of the percolation beds at the DWTP from 2000 through 2004. Percolation rates observed by City staff in each individual percolation bed suggests that approximately 60% of the City's combined percolation capacity occurs in the western percolation beds. Because the City will not be able to utilize the western percolation beds after construction of a seasonal storage reservoir on the west side of the DWTP, it is assumed that only 40% of the City's current percolation capacity will be available for long-term continued disposal of treated effluent.

Table 8-1: Hollister Project Area Precipitation (inches)[a]

Month	Typical Year	25-Year Return	50-Year Return	100-Year Return
January	5.68	4.01	4.39	4.70
February	0.12	3.26	3.60	3.81
March	0.54	3.16	3.20	3.37
April	0.14	1.75	1.92	1.98
May	0.17	0.88	1.04	1.18
June	0.06	0.28	0.30	0.34
July	0.84	0.16	0.22	0.46
August	0.56	0.11	0.19	0.46
September	0.06	0.66	1.13	1.80
October	0.81	1.13	1.20	1.44
November	3.14	2.73	2.68	2.86
December	4.51	3.34	3.50	3.73
TOTAL	**16.63**	**21.46**	**23.35**	**26.12**

[a]The information in this table was obtained from the Technical Memorandum (RMC, 2005).

Table 8-2: Combined Historical Percolation Rates at the Hollister DWTP

Month	Year (MGD)					Minimum Percolation Rate	Average Percolation Rate
	2000	2001	2002	2003	2004		
January	2.01	1.56	1.22	1.03	1.32	1.03	1.43
February	1.79	0.78	1.81	1.47	1.72	0.78	1.51
March	1.76	0.79	1.22	1.72	1.16	0.79	1.33
April	2.29	2.53	1.49	1.50	1.33	1.33	1.83
May	2.30	2.14	2.87	2.88	2.44	2.14	2.53
June	1.87	2.33	2.39	3.01	3.29	1.87	2.58
July	2.27	2.56	2.77	2.43	2.34	2.27	2.47
August	2.66	2.19	2.72	2.87	2.69	2.19	2.63
September	2.47	1.83	2.56	2.59	2.53	1.83	2.40
October	2.05	1.56	1.88	2.04	2.16	1.61	1.94
November	1.91	1.61	1.65	1.90	1.70	1.61	1.75
December	1.27	1.01	2.30	1.49	1.65	1.01	1.54

Because the percolation rates presented in **Table 8-2** represent actual volumes of water percolated (and not percolation capacity), they are considered somewhat conservative. For the purposes of the LTWMP water balance, it was assumed that the City will be able to continue to percolate at least 40% of their historical average percolation rates at the DWTP.

8.2.3. Irrigation Demands

Crop irrigation demands will be the primary method of disposing of treated effluent from the DWTP. As discussed above, the City will not be able to apply treated effluent for irrigation purposes at any rate that exceeds the agronomic uptake rate. This agronomic uptake rate is a function of the type of crop being irrigated, the time of the growing season, and the amount of precipitation. As a result, the amount of land that will need to be irrigated to meet the disposal requirements of the City will also be dependent upon these same factors. **Table 8-3** summarizes net monthly water demands for turf grass, pasture grass, and vegetables during a 100-year rainfall year. In the water balance for the interim project (2013) it is assumed that all of the disposal will be on spray fields as discussed in **Section 7**. Pasture grass has a relatively high water demand of 41.2 inches in a 100-year rainfall year.

Table 8-3: Net Crop Water Demands[a]

Month	100-Year Rainfall Year Water Demands (inches) Turf Grass	Pasture Grass	Vegetables
January	0.0	0.0	0.0
February	0.0	0.0	0.0
March	0.0	0.0	1.4
April	2.5	3.1	4.3
May	4.7	5.9	1.8
June	5.7	8.3	0.1
July	6.2	8.9	1.0
August	5.7	8.2	2.0
September	2.3	4.2	0.6
October	1.2	2.6	1.2
November	0.0	0.0	0.0
December	0.0	0.0	0.0
TOTAL	**28.3**	**41.2**	**12.4**

[a]The information in this table was obtained from the Technical Memorandum (RMC, 2005).

Because the City's goal is to ultimately maximize the reuse of recycled water for irrigation, it cannot be assumed that all of the water will always be used for irrigation of pasture grass. It is anticipated that the City will ultimately use this water to also irrigate some combination of turf grass, vegetables, trees, and other vegetation. For the purposes of the water balance, it was assumed that crop water demands for the City's ultimate project would be roughly equivalent to the water demands of irrigated turf (28.3 inches).

8.2.4. Seasonal Storage Reservoir Size

Water balances were prepared for the interim Recycled Water Project-Phase I (2013) and the Recycled Water Project-Phase II (2023). The results of the water balances are summarized in **Table 8-4**. **Table 8-4** suggests that by 2013 the City's LTWMP will require approximately 1,500 AF of annual seasonal storage. In order for the City to draw this reservoir down before the beginning of each wet season, it is estimated that the City will need at least 875 acres of spray fields assuming 100-Year rainfall water demands for pasture grass as presented in **Table 8-3** above. **Table 8-4** further suggests that the City's seasonal storage requirements will increase to approximately 2,000 AF by the year 2023. The amount of irrigated acreage that will be required for the City to dispose of all of its annual effluent production will be dependent upon the type crop irrigated. Assuming 100-Year rainfall water demands for irrigated turf as presented in **Table 8-3**, it is estimated that the City will require at least 1,775 acres of turf (or comparable crop) by the year 2023. These numbers are preliminary and are for planning purposes.

Table 8-4: Summary of LTWMP Water Balance

Planning Criteria	Phase I 2008 through 2013	Phase II 2013 through 2023
Seasonal Storage Reservoir (AF)	1,500	2,000
Irrigated Acreage (Acres)	875[a]	1,775[b]

[a]Assumes Irrigation of pasture grass with a 100-Year annual irrigation demand of 41.2 inches.
[b]Assumes irrigation of Row Crops or Turf grass with a 100-Year annual irrigation demand of 28.3 inches.

Table 8-5 presents the details and assumptions used in the water balance for the Recycled Water Project-Phase I. **Table 8-6** presents an updated water balance for the Recycled Water Project-Phase II for the year 2023. The flows and planning horizon for **Table 8-6** are consistent with the City's current draft General Plan.

Table 8-5: Water Balance for City of Hollister LTWMP Phase I Interim Effluent Management Project (2008-2013)

Month	Average Daily Flow (MGD)[a]	Monthly Wastewater Flow (MG)[b]	Monthly Wastewater Flow (AF)[b]	Monthly Precipitation (AF)[c]	Monthly Percolation (AF)[d]	Monthly Evaporation (AF)[e]	Irrigation Demands (AF)[f]	Surplus Water (AF)[g]	Cumulative Storage (AF)[h]
January	3.58	111	341	29.0	-54.2	-8.8	0.0	307	911
February	3.58	100	308	23.5	-52.4	-12.0	0.0	267	1,177
March	3.58	111	341	20.8	-50.4	-16.2	0.0	295	1,472
April	3.58	107	330	12.2	-67.2	-19.4	-226.0	29	1,501
May	3.50	108	333	7.3	-96.1	-26.9	-430.2	-213	1,288
June	3.41	102	314	2.1	-94.8	-33.3	-605.2	-417	871
July	3.41	105	324	2.8	-94.2	-37.5	-649.0	-453	417
August	3.41	105	324	2.8	-99.9	-34.3	-597.9	-405	12
September	3.41	102	314	11.1	-88.4	-26.9	-306.3	-96	0
October	3.41	105	324	8.9	-74.2	-21.3	-189.6	48	48
November	3.50	104	322	17.7	-64.5	-14.4	0.0	261	309
December	3.58	111	341	23.0	-59.0	-9.7	0.0	295	604

[a]Average Daily Flow (ADF) for the year 2013 (See Table 4-2). Assumes ADF equals ADWF from June until October and assumes 5% average I/I from December until April.
[b]ADF is totaled for each month.
[c]Monthly precipitation calculated for 100-Year Precipitation Return Event (See Table 8-1).
[d]Monthly percolation rates calculated assuming 40% percolation of average DWTP percolation from 2000 through 2004 (See Table 8-2).
[e]75% of mean monthly pan evaporation data for Hollister from 1962 through 1966 (Ref: DWR, Evaporation from Water Surfaces in California, Bulletin 73-79, November 1979).
[f]Irrigation demands are assumed for irrigated pasture in a 100-Year Rainfall Year (See Table 8-3).
[g]Surplus water is calculated as the net amount of water for each month that cannot be disposed of on spray fields and must added to the seasonal storage reservoir.
[h]Cumulative storage is the accumulated amount of water for which the City must provide seasonal storage.

Table 8-6: Water Balance for City of Hollister LTWMP Phase II Recycled Water Project (2013-2023)

Month	Average Daily Flow (MGD)[a]	Monthly Wastewater Flow (MG)[b]	Monthly Wastewater Flow (AF)[b]	Monthly Precipitation (AF)[c]	Monthly Percolation (AF)[d]	Monthly Evaporation (AF)[e]	Irrigation Demands (AF)[f]	Surplus Water (AF)[g]	Cumulative Storage (AF)[h]
January	4.73	146	450	29.0	-54.2	-8.8	0.0	416	1,347
February	4.73	132	406	23.5	-52.4	-12.0	0.0	365	1,712
March	4.73	146	450	20.8	-50.4	-16.2	0.0	404	2,116
April	4.73	141	435	12.2	-67.2	-19.4	-369.8	-9	2,107
May	4.61	142	439	7.3	-96.1	-26.9	-695.2	-372	1,735
June	4.5	135	414	2.1	-94.8	-33.3	-843.1	-555	1,180
July	4.5	139	428	2.8	-94.2	-37.5	-917.1	-618	562
August	4.5	139	428	2.8	-99.9	-34.3	-843.1	-546	16
September	4.5	135	414	11.1	-88.4	-26.9	-340.2	-30	0
October	4.5	139	428	8.9	-74.2	-21.3	-177.5	164	164
November	4.61	138	425	17.7	-64.5	-14.4	0.0	364	528
December	4.73	146	450	23.0	-59.0	-9.7	0.0	404	931

[a]Average Daily Flow (ADF) for the year 2013 (See Table 4-2). Assumes ADF equals ADWF from June until October and assumes 5% average I/I from December until April.
[b]ADF is totaled for each month.
[c]Monthly precipitation calculated for 100-Year Precipitation Return Event (See Table 8-1).
[d]Monthly percolation rates calculated assuming 40% percolation of average DWTP percolation from 2000 through 2004 (See Table 8-2).
[e]75% of mean monthly pan evaporation data for Hollister from 1962 through 1966 (Ref: DWR, Evaporation from Water Surfaces in California, Bulletin 73-79, November 1979).
[f]Irrigation demands are assumed for irrigated turf in a 100-Year Rainfall Year (See Table 8-3).
[g]Surplus water is calculated as the net amount of water for each month that cannot be disposed of on spray fields and must added to the seasonal storage reservoir.
[h]Cumulative storage is the accumulated amount of water for which the City must provide seasonal storage.

9. Recommended LTWMP

The recommended interim and long-term effluent management projects, the Phase I and Phase II Projects, respectively, along with the recommended MBR wastewater treatment plant and seasonal storage reservoir are presented in this Section. The Section begins with a description of the DWTP and reservoir followed by the Phase I and II Project components.

The City of Hollister developed and evaluated treatment alternatives for the LTWMP in **Section 6**. Based on the analysis of projected growth in the service area, a treatment plant with a capacity of 5.0 MGD is recommended. An MBR wastewater treatment process is recommended because it best meets the need for current and future effluent quality. Constructing a new DWTP will relieve treatment and disposal demands on the IWTP. The IWTP has sufficient treatment capacity to handle wastewater from the City's only industrial discharger, San Benito Foods. No modifications to the IWTP are therefore recommended.

The City, County and SBCWD have agreed upon an effluent management plan that includes interim spray fields for the near term (Phase I Project) and a recycled water project (Phase II Project) for long-term effluent disposal. Based on the water balance presented in **Section 8**, a 1,500 AF seasonal storage is required with and additional 500 AF of seasonal storage to be provided in the future. The key components of the LTWMP discussed in this Section include:

- Domestic Wastewater Treatment Plant (DWTP)
- Recycled Water Seasonal Storage
- Phase I Interim Effluent Management Project (Phase I Project)
- Phase II Recycled Water Project (Phase II Project)

Refer to **Figure 9-1** for the recommended locations for the DWTP and the seasonal storage reservoir.

9.1. Domestic Wastewater Treatment Plant

The goal of this report is to describe the recommendations for final design of the Domestic Wastewater Treatment Plant. This Section summarizes the recommendations for improvements at the DWTP, which have been generally organized into the following subsections:

- Pretreatment,
- Membrane Bioreactor,
- Disinfection,
- Effluent Facilities,
- Ancillary Facilities,
- Solids Handling,
- Buildings, and
- Electrical and Control Systems.

A process flow diagram of the recommended DWTP improvements is shown in **Figure 9-2**. A site plan showing the proposed location of the various facilities is shown in **Figure 9-3**.

A summary of the process design criteria and equipment capacities is presented in **Table 9-1**.

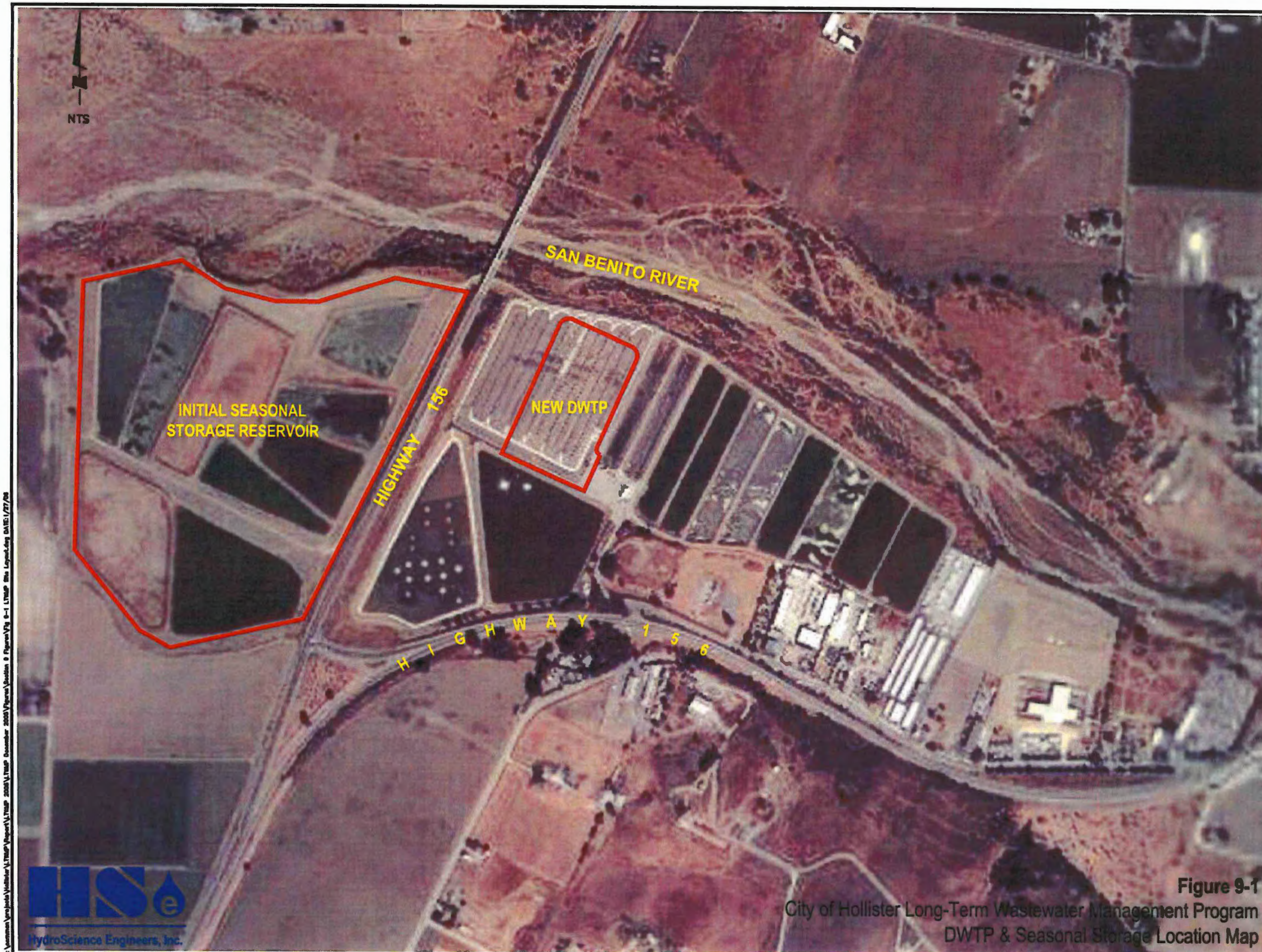


Figure 9-1
City of Hollister Long-Term Wastewater Management Program
DWTP & Seasonal Storage Location Map

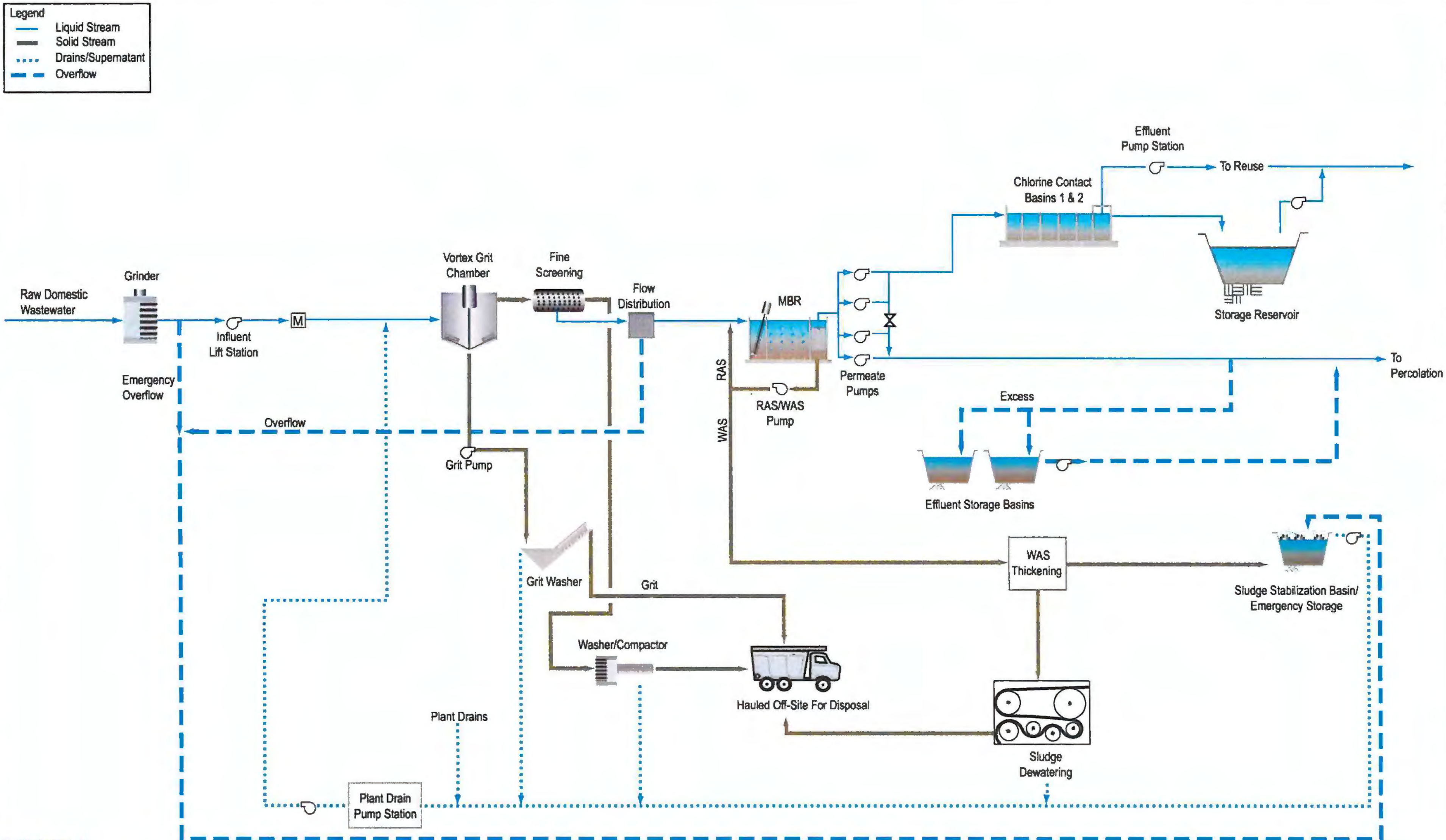
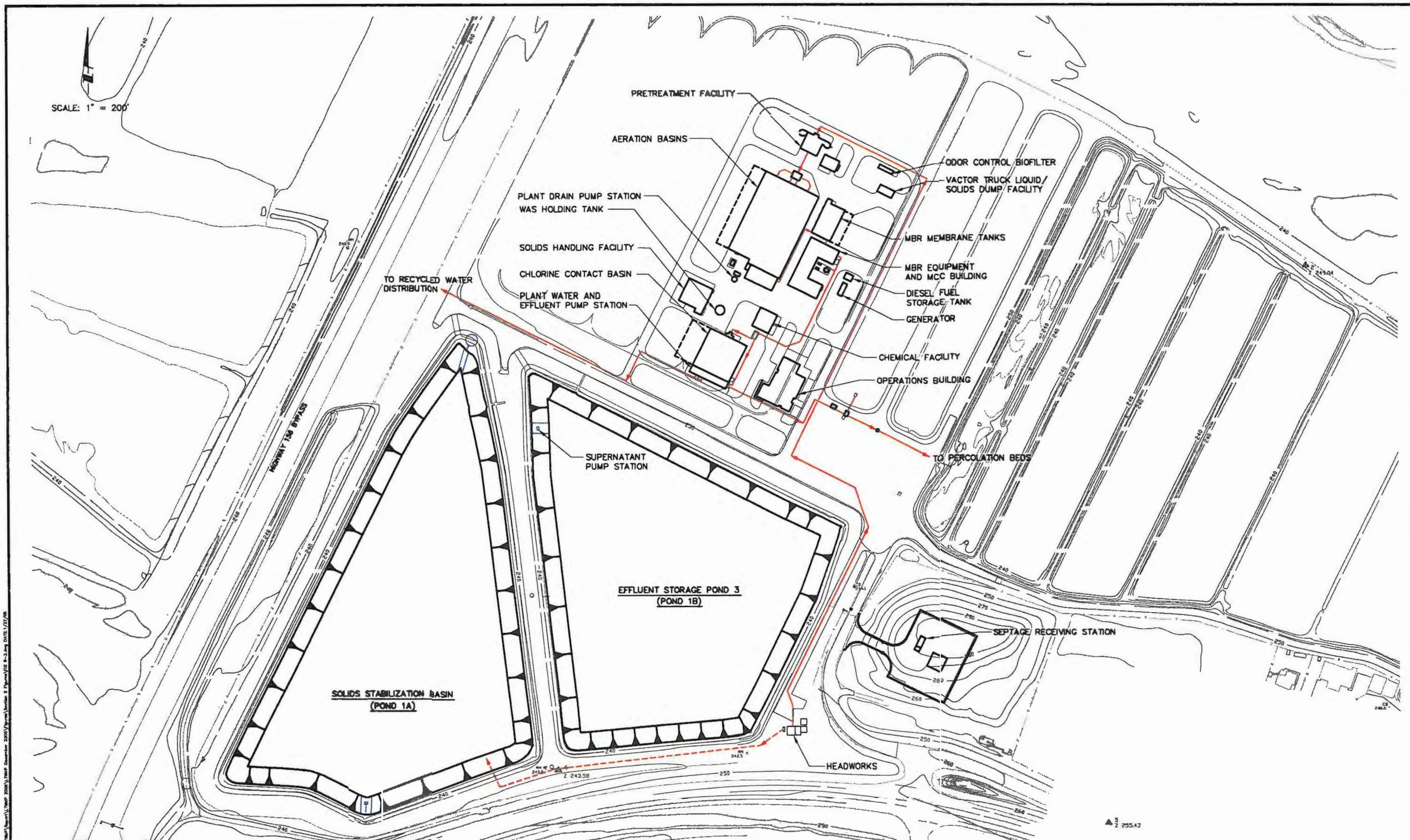


Figure 9-2
City of Hollister Long-Term Wastewater Management Program
DWTP Process Flow Diagram



HydroScience Engineers, Inc.

Figure 9-3

City of Hollister Long-Term Wastewater Management Program

DWTP Site Layout

This table is based on a design for the DWTP with a nominal plant capacity of 5.0 MGD.

Table 9-1: DWTP Design Criteria and Process Capacities

Parameter	Value
Design flows	
ADWF (Average Dry Weather Flow)	4.5 MGD (3125 gpm)
PWWF (Peak Wet Weather Flow)	5.0 MGD (3470 gpm)
ADF (Average Design Flow)	5.0 MGD (3470 gpm) (nominal plant capacity)
MDF (Maximum Day Flow)	6.0 MGD (4165 gpm)
PHF (Peak Hour Flow)	10.0 MGD (6940 gpm)
Peak Instantaneous Flow	15.0 mgd (10400 gpm)
Treatment process	
Secondary and tertiary	Immersed Membrane Bioreactor (MBR)
Expected effluent quality	
BOD	<10 mg/L
TSS	<10 mg/L
Turbidity	<0.2 NTU daily average
Nitrate	<5 mg/L
Expected influent quality	
BOD	350 mg/L
TSS	400 mg/L
Ammonia	40 mg/L
TKN	50 mg/L
Nitrate	15 mg/L
Alkalinity	400 mg/L
TDS	1,200 mg/L
Temperature	16 degrees C
Existing pretreatment	
Grinding	In-channel grinder
Capacity	15.0 MGD
Power	5 hp
Existing influent pump station	
Number of pumps	3 (2 Duty, 1 Standby)
Type	Self Priming (1 continuous speed, 2 VFD)
Capacity	4.0 MGD each
TDH	23 ft
Motor power	30 hp
Existing odor control	
Method	Corrosion resistant plate covered channels with odor control biofilter
Odor control biofilter surface area	130 sq ft
Odor control biofilter capacity	390 cfm
Loading rate	3.0 cfm/sq ft
Number of blowers	1
Pressure	10 in Water Column
Motor Power	3.0 hp (1.58 hp operating)
Existing flow measurement	
Quantity	1
Type	Magnetic flow meter
Size	16 inch
Range	0-28 MGD
Pretreatment	
Grit Chamber	
Type	Vortex
Capacity	12 MGD
Diameter	12 ft

Parameter	Value
Drive power	1 hp
Grit pump	Recessed impeller
Power	5.0 hp
Capacity	250 gpm
Grit classifier	Inclined screw type
Power	1.0 hp
Fine Screens	
Type	Perforated rotary drum screen
Opening size	1 mm
Quantity	2
Flow Capacity	8.0 MGD each
Drum diameter	60 in
Drum length	160 in
Drive power	2.0 hp each
Spray washwater required	60 gpm @ 40 psi, intermittent use-recycled water
Screenings transport	Covered sluice
Sluice washwater required	150 gpm @ 6 psi, continuous-screened wastewater
Sluice washwater pump	Submersible, 2 hp
Screenings processing	Washer/compactor w/ grinder
Quantity	1
Grinder	10 hp
Screw compactor	3.0 hp
Odor control biofilter	
Method	Synthetic media biofilter
Media volume	1,040 cu ft
Odor control biofilter capacity	2,200 cfm
Residence time	30 sec
Number of blowers	1
Pressure	12 in Water Column
Motor Power	5 hp
MBR process trains	
General	
Number of process trains	4 train biological w/ 4 MBR tanks
Process train basins	De-oxygenation, anoxic, aeration, post-anoxic, membrane (all basins concrete)
Membrane system flow (initially installed)	4.0 MGD (average) 4.8 MGD (peak day)
Membrane system flow (w/ added membranes)	5.0 MGD (average) 6.6 MGD (peak day)
Control system	PLC
De-oxygenation basins	
Purpose	Reduce dissolved oxygen of recirculated mixed liquor
Quantity	1 per train (4 total)
Volume	75,400 gallons per basin (301,600 gallons total)
Dimensions	14 ft x 30 ft per basin
Operating water depth	24 ft
Mixed Liquor Suspended Solids	9,900 mg/L
HRT	1.45 hours (@ ADF 5.0 MGD)
Anoxic basins	
Quantity	2 per train; 8 total anoxic basins
Volume	72,260 gallons per basin (578,080 gallons total)
Dimensions	14 ft x 30 ft per basin
Operating water level	23 ft
Mixed Liquor Suspended Solids	8,500 mg/L
HRT	2.77 hours (@ ADF 5.0 MGD)
Post-Anoxic basins	
Quantity	1 per train; 4 total post-anoxic basins
Volume	70,690 gallons per basin (282,760 gallons total)

Parameter	Value
Dimensions	15 ft x 30 ft per basin
Operating water level	21 ft
Mixed Liquor Suspended Solids	8,500 mg/L
HRT	1.35 hours (@ ADF 5.0 MGD)
Anoxic mixer	
Type	Submersible
Quantity	1 per anoxic basin (12 total)
Capacity	8 hp/ Mixer
Mixer power	96 hp total
Aeration basins	
Quantity	4 per train, 16 total
Volume	129,600 gallons per basin (2,073,600 gallons total)
Dimensions	27.5 ft x 30 ft x 21 ft SWD per basin
Operating water level	21 ft
Mixed Liquor Suspended Solids	8,500 mg/L
HRT	9.95 hours (@ ADF of 5.0 MGD)
SRT	20 days
Aerator type	Fine bubble diffusers
Process air flow required	1,459 scfm per basin (5838 scfm total)
Process air blowers	
Type	Positive displacement
Quantity	5 total (4 duty, 1 standby)
Control	Continuous operation VFD drive
Capacity	2,538 scfm each (total 10,152 scfm)
Discharge pressure	11.6 psig
Motor power	200 hp each, 800 hp total
Membrane tank	
Quantity	4
Volume	45,930 gallons per basin (183,720 gallons total)
Dimensions	10 ft x 63 ft per basin
Operating water level	9.67 ft
Mixed Liquor Suspended Solids	9,900 mg/L
HRT	0.9 hours (@ ADF of 5.0 MGD)
Membrane aeration (scour air) blowers	
Type	Rotary positive displacement
Quantity	4 total (4 duty, 1 standby-shared w/ process blowers)
Control	Continuous operation
Capacity	2,629 scfm each (total 10,516 scfm)
Discharge pressure	5.1 psig
Motor power	100 hp each, 400 hp total
Membrane modules	
Type	Hollow fiber
Quantity of modules	280 per membrane train (1,120 total) (4.0 mgd membranes installed initially) Future 352 modules/train (1,408 total)
Quantity of cassettes (@ 48 modules per cassette, max)	6 cassettes per process train (30 total)
Spare space allowed (future cassettes)	3 spaces per train (10 total)
Pore size	0.04 micron
Surface area	340 square feet per module (380,800 square feet total) Future (478,420 square feet total)
Flux at average day flow	10.5 gfd (gallons/sq ft/day) (Future 10.44 gfd)
Flux at peak day flow	12.6 gfd (Future 12.5 gfd)
Permeate pumps	
Quantity	4 (4 duty, 1 standby shelf spare)

Parameter	Value
Type	Horizontal end suction centrifugal
Capacity	1,569 gpm each
TDH	39 ft
Motor power	25 hp each, 100 hp total
Control	VFD drive
Mixed liquor recirculation pumps	
Quantity	5 (4 duty, 1 spare)
Type	Axial flow pumps
Capacity	6,076 gpm each
TDH	10.5 ft
Motor Power	40 hp each, 160 hp total
Control	VFD drive
Backwash System	
Backwash pump quantity	2 (1 duty, 1 standby)
Capacity	2,040 gpm @ 27 ft TDH
Motor Power	20 hp each, 40 hp total
Tank type	Polyethylene
Tank quantity	1
Tank working capacity	6,340 gallons
Tank diameter	8.66 ft
Tank side wall height	16 ft
Maintenance clean hypochlorite design dose	500 mg/L
Chemical feed pump type	Air operated double diaphragm
Pump quantity	2
Hypochlorite solution strength	5% - 12% trade strength
Metering pump range	0-10,200 L/hr
Control strategy	Manual adjustment based on solution strength
Staging tank	
Tank type	Concrete
Tank quantity	1
Tank working capacity	4,000 gal
Tank dimensions	7 ft x 9 ft
Tank side wall height	9.5 ft
Chlorine contact basin	
Number of basins	2
Channel length	435 ft (per channel)
Channel width	8 ft (per channel)
Channel depth	9 ft
Number of passes	5 per basin
L/W ratio	54:1
Contact time	135 min @ ADF, 112 min @ MDF
Chlorine mixer	Submersible induction, 2 hp
Hypochlorite storage and handling facilities	
Storage tank type	High density cross-link polyethylene
Quantity tanks	1 (1 additional future)
Storage volume	8,000 gallons (nominal)
Tank diameter	12 ft
Tank sidewall height	11 ft
Hypochlorite solution strength	12.5% trade strength
Hypochlorite design dose	20 mg/L
Hypochlorite feed rate	42.3 gph (@ 5.0 MGD, 12.5% solution) (reclamation system)
Metering pump type	Peristaltic pump with variable speed input (4-20mA)
Quantity pumps	2 total (1 duty, 1 standby)
Metering pump range	0.43 – 51.6 gph
Control strategy	ORP/flow paced with chlorine residual backup
Plant water pumping facilities	

Parameter	Value
Purpose	Pump recycled water for plant water
Type	Vertical turbine
Quantity pumps	3 (2 duty, 1 standby)
Capacity	200 gpm @ 190 ft TDH each
Motor power	25 hp
Control	Variable speed control to maintain system pressure, with level switch turnoff
Flow measurement	Magnetic flow meter on pump station discharge line
Sludge handling	
WAS thickening	
Purpose	Reduce WAS volume
Sludge yield	0.85 lb MLSS/lb BOD
WAS feed	12,400 lbs dry solids per day
WAS concentration	1.0 % dry solids
WAS volume	150,000 god
WAS thickener type	Gravity belt thickener
Quantity	1
Effective belt width	2 meter
Operation	5 days/wk; 10 hr/day
Design capacity	400 gpm/meter (maximum)
Actual loading	175 gpm/meter
Thickened WAS concentration	5 %
Washwater requirement	25 gpm/meter
Thickener capacity @ 1.0 % feed solids	66,650 lbs/wk
Belt press feed pump	Progressive cavity (270 gpm capacity)
Thickened WAS pump	Progressive cavity (55 gpm capacity)
WAS day tank	Bolted steel tank (60,000 gallon)
Sludge Dewatering	
Design capacity	800 lbs/m/hr (maximum)
Effective belt width	2 meter
Operation	5 days/wk; 12 hr/day
Actual Loading	725 lbs/m/hr (@ 5 days/wk; 12 hr/day)
Dewatered sludge concentration	16 %
Washwater requirement	15 gpm/meter (Qty. 2 spray bars)
Dewatered sludge conveyor	Inclined screw conveyor
Capacity	600 cut/hr
Size	12 inch diameter
Motor power	7.5 hp
Load out conveyor	Horizontal screw conveyor
Size	12 inch
Motor power	5 hp
Discharge points	3 each on load out conveyor w/ automatic slide gate
Sludge stabilization basin (SSB)	
Purpose	Stabilize and store sludge
Quantity	1
Volume	37 million gallons
Surface Area	426,000 sq ft
Surface Loading	16.5 lb VSS/1,000 sq ft/ day
Discharge method	Supernatant removed by pump station, sludge removed by future dredging
Primary aeration	Solar circulators
Quantity	2
Capacity	10,000 gpm each
Aeration	Surface aerators
Quantity	8
Horsepower	5 hp each (40 hp total)
Supernatant return pump station	

Parameter	Value
Purpose	Return SSB supernatant to pretreatment
Type	Self-priming centrifugal
Decant method	Floating decant suction strainer
Quantity	2 (1 duty, 1 standby)
Capacity	130 gpm @ 40' TDH each
Motor power	5 hp each
Control	Constant speed, level switch shutoff, timer operation
Plant drain pump station	
Purpose	Collect process drainage and onsite sanitary sewerage and pump to pretreatment
Type	Submersible sewage pumps
Capacity	350 gpm @ 50' TDH each
Quantity	3 (2 duty, 1 standby)
Wet well	10 ft diameter
Depth	25 ft
Effluent Disposal Facilities	
Effluent pump station	
Purpose	Pump effluent to offsite reuse areas
Type	Vertical turbine pumps
Capacity	3,500 gpm @ 110' TDH each
Quantity	3 (2 duty, 1 standby)
Wet well	10 ft x 30 ft x 15 ft
Effluent emergency storage	
Quantity	2
Volume	6 million gallons each
Inlet	Gravity overflow from effluent pump station/flow split structure
Outlet	Gravity to existing pump station

9.1.1. Pretreatment Facilities

Raw wastewater will be pumped from the existing influent lift station to a new plant pretreatment facility. The new pretreatment facility, shown in **Figure 9-4** will consist of a grit chamber followed by fine screens. The proposed pretreatment facility is elevated to allow gravity flow to the downstream processes.

9.1.1.1. Grit Chamber

Raw wastewater will be pumped through a new force main to a vortex-type grit chamber, which will remove fine, inorganic, inert, sand-like materials from the wastewater. Up to 95% of the grit greater than 100 mesh (0.150 mm) in size are removed by the grit chamber to reduce wear on downstream processes due to the abrasive nature of the grit materials. Wastewater will enter the circular grit chamber tangentially and will flow around the tank along with a submerged impeller to create a vortex flow pattern that will allow the grit to settle out but keeping the lighter organic material in suspension, which will flow out the grit chamber outlet to the downstream processes.

A single grit chamber with a capacity of 12.0 MGD will be constructed for the 5.0 MGD ADWF plant. In the future a second 12.0 MGD grit chamber will be constructed to handle the peak flow at ultimate buildout. Grit removed from the grit chamber will be directed into a lower grit hopper where it will be periodically removed by a recessed impeller or self-priming grit pump. From the grit hopper, the grit will be pumped to a grit classifier, which will consist of a cyclone grit concentrator and an inclined screw grit classifier.

The grit classifier will act as a high-rate, settling device for separation of residual organic materials and retention of the grit. Organic material will be washed out and returned to the process via a drain system. The inclined screw will then transport the grit to the discharge chute and enable free water to run back into the classifier while the dewatered grit will be discharged into a dumpster. Well-washed grit, washed with non-potable water produced by the MBR system, has minimal odor since it is predominately inorganic material.

9.1.1.2. Fine Screening

MBR manufacturers require fine screening to remove coarse material as well as hair and stringy material that may result in physical damage to the immersed membranes. The MBR manufacturer requires a screen with a maximum screen opening of 1 mm. A rotary drum screen will be selected to fulfill the fine screening requirements. The drum screen will consist of a perforated, stainless steel drum and will be mounted above a concrete channel. Wastewater will be directed into the center of the drum screen and will flow through the perforated drum to the outside of the screen.

Screened wastewater will fall through the drum and be collected in the channel below. Solids larger than the perforations will be retained on the screen. The drum screen will rotate and vanes or baffles will move accumulated solids up out of the end of the drum. A washwater spray bar flushing the screenings off the drum will clean the screen.

Two fine screens in parallel will be required. Each screen will be sized for 8.0 MGD, thereby allowing for a total screening capacity of 16.0 MGD at peak flow. This dual screen arrangement will provide 100% screening at the peak instantaneous flow. The screens will be isolated with influent slide gates.

Collected screenings will be transported from the fine screens to the washer/compactor via an enclosed sluiceway. The sluice will be fabricated from stainless steel and a flush water solenoid will open to transport the screenings using screened wastewater. The enclosed sluice will contain odors associated with wastewater screenings.

9.1.1.3. Screenings Washer/Compactor

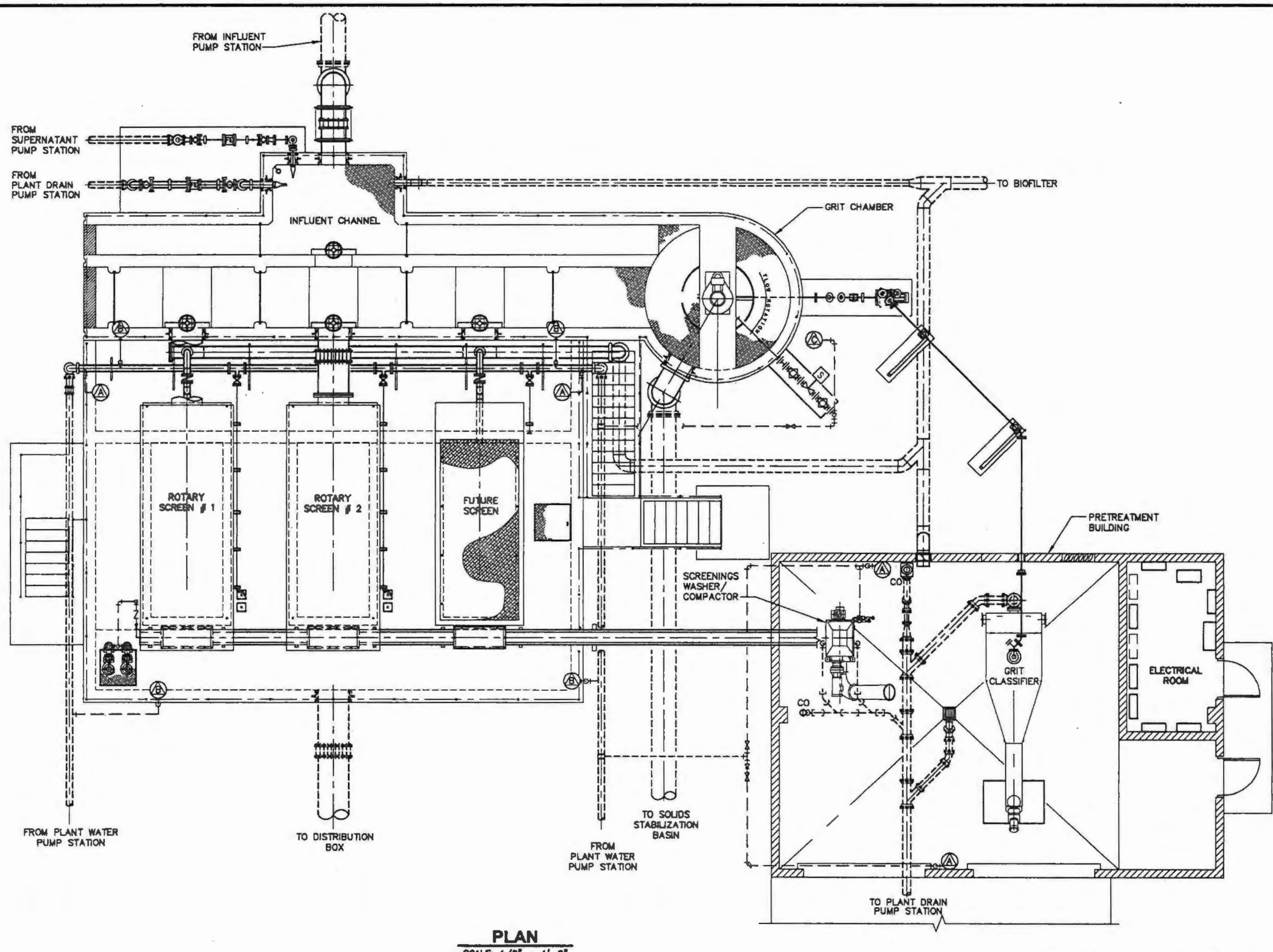
Because of the small openings of the fine screen the potential for the screen to collect and remove organic material such as fecal matter is high, thereby increasing the risk for odor generation as well as problems for disposal of the screenings. A washer/compactor will be required to clean or wash out the organic matter and to compact the screenings to reduce volume. The cleaned and dried screenings must be able to pass a paint filter test and achieve a minimum percent solids concentration in order to be accepted at landfills for disposal.

The screenings will be dropped from the sluice through an enclosed chute into the screenings washer/compactor. The screenings will pass through a grinder or agitator and will be agitated and hit with a high-pressure wash to break up the fecal matter. The fecal matter will be washed through a fine screen and will flow out a drain into the plant drain system where it will be collected and pumped back through the pretreatment for re-processing.

The washed screenings will be compacted by an integrated screw press. This screw press will act to press out the residual water from the screenings and to transport the screenings to a waste container. The washer/compactor and the screenings dumpster will be located inside a building in order to contain odors and to reduce vector attraction. The building will be ventilated through the odor control biofilter described below.

9.1.1.4. Odor Control Biofilter

The new pretreatment facility will be designed to be fully enclosed with all open channels covered with removable checkered plates or with a concrete decking to help contain odors inside



HydroScience Engineers, Inc.

Figure 9-4
City of Hollister Long-Term Wastewater Management Program
Pretreatment Facilities Plan

the grit chamber and fine screen areas. Additionally, the grit washer and screenings washer/compactor areas, along with their associated dumpsters, will be enclosed in a building. Foul air will be collected from the airspace of the pretreatment structures and from the grit washer and screenings building. A foul air blower will provide the necessary negative pressure to insure that the outside air is drawn into the pretreatment airspace and into the dumpster building. Ultimately, the foul air will be conveyed to an odor control biofilter for treatment.

The odor control biofilter will consist of a packaged synthetic media biofilter. The foul air will be collected in ductwork from the various facilities. The odor control unit is complete with a humidification section, synthetic media, a moisture control system, discharge blower and controls. The foul air will then be distributed through the biofilter media. Bacteria that are naturally growing in the media will remove the odor-causing compounds. A water sprinkler system using recycled water will maintain the optimum moisture content in the bed to promote good biological growth.

The biofilter will be designed to also treat foul air collected from the plant drain pump station. The biofilter manufacturer guarantees the media for ten years. The spent media can be replaced or regenerated.

9.1.2. Membrane Bioreactor

The recommended secondary/tertiary process for the LTWMP is an immersed membrane bioreactor (MBR). The MBR will provide high quality water for disposal and will best fit the City's needs for future water reuse. The MBR combines a suspended growth biological reactor for activated sludge treatment with submerged membranes for solids separation. The membranes are contained within the biological tanks and would replace the clarifiers used in conventional activated sludge plants. To expedite design of the MBR system, the City solicited proposals for the MBR equipment supply. After evaluation of the proposals received, the City selected Zenon Environmental, Inc. as the MBR equipment supplier.

The proposed MBR process consists of anoxic zones for denitrification, an aeration zone for soluble BOD reduction and nitrification, a post-anoxic zone for further denitrification and a membrane zone for solids separation. The proposed MBR process train layout is shown in **Figure 9-5.**

This figure shows expansion of the biological trains and membrane trains as dashed lines. It is important to recognize that the biological system is conservatively designed with a minimum influent temperature of 16°C. This temperature was assumed due to lack of any influent temperature monitoring. Once the MBR plant is in operation, temperature data will be collected to determine the actual minimum influent temperature. Each biological train is rated at 1.25 mgd. Expansion can be accomplished by adding biological trains and membrane trains. The design flow of 5.0 mgd meets the projected growth to the current planning horizon. Additional space for membranes will be provided in each membrane tank. It is important to note that the initial design has allowed for only enough membranes to handle 4.0 mgd ADF conditions. The City of Hollister determined that the full 5.0 mgd membrane capacity was only required after about 10 years based on the projected growth rate for the plant flow. A decision to purchase the additional membranes at a later date was made as a cost savings measure.

9.1.2.1. MBR Influent Distribution

Screened wastewater will flow by gravity from the fine screens to the MBR influent distribution structure that will be used to distribute the wastewater to the MBR process trains. This structure will be covered with checkered plates for odor control. Air from the MBR influent distribution structure will be treated in the odor control biofilter.

The flow will be evenly distributed to each process train by providing a downward acting weir gate for each process train. The weir gates will be manually adjusted to provide a proper flow split to each train. The process trains could be isolated by raising or closing the weir gate. The influent will flow through pipes to each individual process train. The MBR influent distribution structure will be furnished with an emergency overflow weir. This weir will overflow in emergency conditions only. Any overflow will be diverted to the sludge stabilization basin.

9.1.2.2. Deox Zone

A deoxygenation (Deox) zone is located upstream of the anoxic zone. This deox zone preconditions the recirculated mixed liquor from the MBR tanks. The MBR tanks add oxygen to the mixed liquor. Because of the strict nitrate limit anticipated the deox zone was added to reduce the dissolved oxygen recirculated to the anoxic zone. Dissolved oxygen is reduced in the deox zone through endogenous respiration. The deox zone is sized to provide a hydraulic retention time (HRT) of 1.45 hours at a nominal plant flow rate of 5.0 mgd.

9.1.2.3. Anoxic Zone

The next treatment stage of the MBR process is the anoxic zone, which is operated as a completely mixed basin without any aeration. The dissolved oxygen in the anoxic basin will be purposely kept low, typically in the 0.1-0.2 mg/L range, to promote the oxidation of dissolved nitrates into nitrogen gas which is removed to the atmosphere, a process called denitrification. Mixing of the anoxic basins will be accomplished with submersible mixers.

MBR influent wastewater will be transferred in pipes to the anoxic basins. Recycled mixed liquor from the de-oxygenation zone, which is rich in nitrates, will be mixed with the influent wastewater in the anoxic zone, thereby providing a carbon source for the denitrifying bacteria. This mixture of influent and recirculated mixed liquor along with the low dissolved oxygen level promotes the growth of the denitrifying bacteria. This denitrification process is capable of reducing the nitrate level to <5 mg/L nitrates (as N) to meet Basin Plan requirements.

The anoxic basin will be divided into two sections to reduce short-circuiting. The anoxic basin has a HRT of approximately 2.76 hours at 5.0 mgd. A recycle rate of approximately *6Q* (six times the average influent flow rate) will be required to reduce the nitrates to the design level. The anoxic zones at the plant will be designed with four parallel trains to allow for continued operation when one basin is removed from service for maintenance.

9.1.2.4. Aeration Zone

The next stage of the MBR system is the aeration zone. Wastewater will flow by gravity from the anoxic basin to the aeration basin will flow by gravity. The aeration zone will be equipped with fine bubble diffusers for mixing and oxygen transfer. The aeration zone is typically operated with a dissolved oxygen level of 2-3 mg/L. The aeration zone establishes an environment to promote a suspended biological growth that breaks down the soluble BOD by converting it into cellular biomass. The aeration zone is also designed to promote growth of nitrifying bacteria, which oxidize ammonia into nitrates – a process called nitrification.

Four aeration trains are designed to provide the ability to continue processing wastewater with one train out of service. The aeration basin will be designed with a hydraulic retention time (HRT) of approximately 10.3 hours at the nominal flow rate of 5.0 mgd. The aeration zone will operate with a mixed liquor suspended solids (MLSS) concentration of approximately 8,500 mg/L. Fine bubble, membrane disk diffusers will provide process air and mixing power to the aeration zone. Aeration air will be provided to the system by positive displacement blowers, which will be located in a blower building equipped with sound attenuation and climate control.

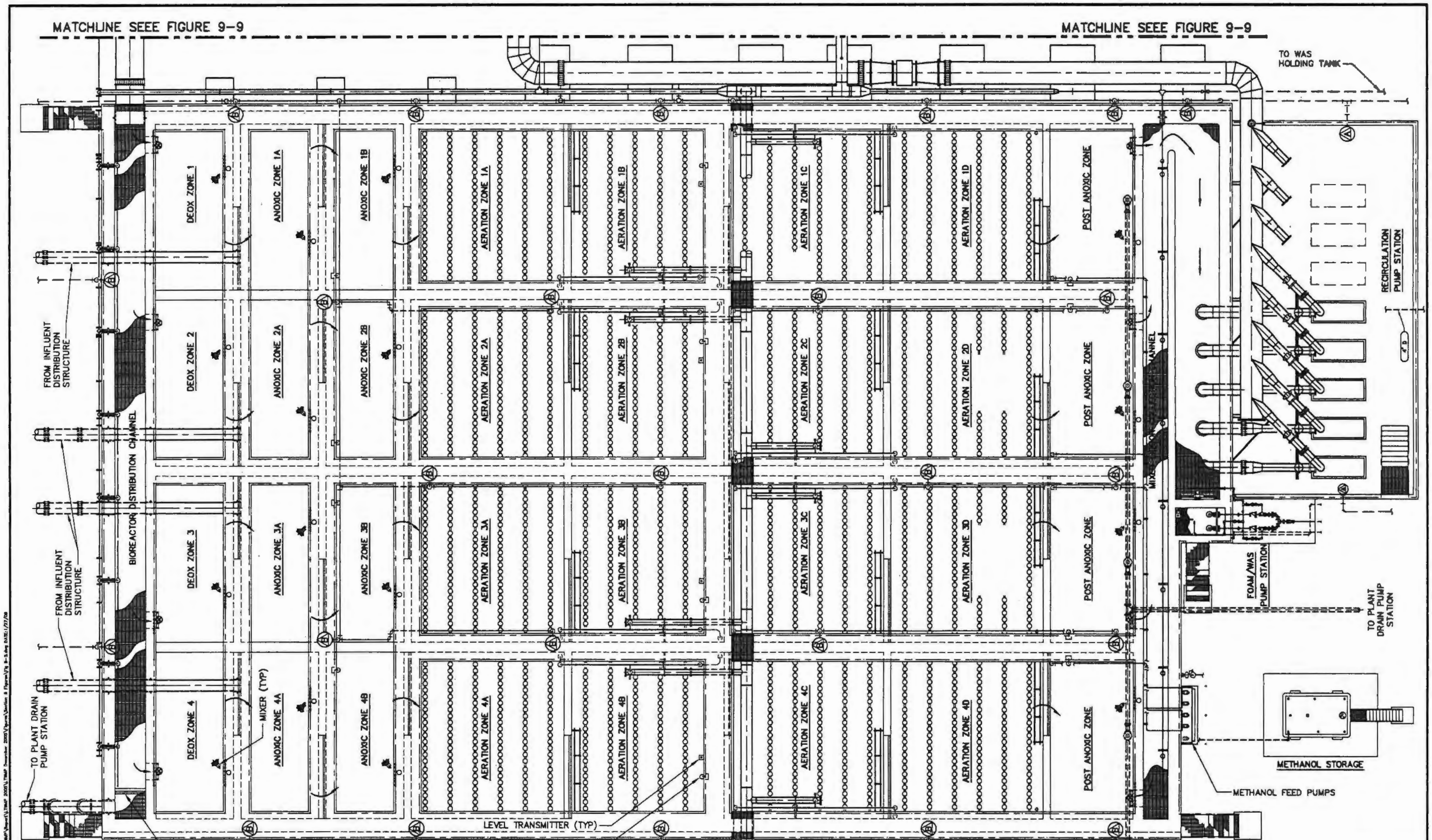


Figure 9-5
City of Hollister Long-Term Wastewater Management Program
MBR Process Trains Plan

Four (4) VFD driven process blowers will be provided for the biological process requirements. One (1) additional blower will be provided as a "swing" blower for standby for use as either a process blower or membrane blower.

9.1.2.5. Post-Anoxic Zone

The aeration basins overflow into post-anoxic basins, which are designed to further enhance the denitrification process. The post-anoxic basins have a hydraulic retention time of approximately 1.3 hours at 5.0 mgd. Each basin is equipped with a submersible mixer. A source of supplemental carbon, either methanol or ethanol, may be required during certain flow and loading conditions. An aboveground, fuel-type storage tank and gear pumps are used for storage and feed of the methanol. The denitrification process is highly dependent on wastewater temperatures and nitrogen loading. The supplemental carbon will probably not be required on a year round basis.

The flow exits the post-anoxic basin through slide gates into the mixed liquor collection channel. The mixed liquor is pumped from this channel to the membrane distribution channel. Six (6) axial flow pumps (5 duty, 1 standby) will be used to provide a flow up to six (6) times Q (influent flow). The mixed liquor recirculation pumps will be VFD driven for flow control. The pumps feed a 48-inch header pipe to transport the mixed liquor to the MBR tanks. A 42-inch magnetic flowmeter will be provided to measure and control the recirculation rate.

9.1.2.6. Membrane Zone

The immersed membranes are located in a separate zone for each process train. The selected Zenon membrane configuration will consist of hollow fiber ultrafiltration membranes. These membranes have a nominal pore size of 0.04 microns. The process will have four membrane trains so that the plant flow could be maintained even with one membrane train out of service for cleaning or maintenance. The membrane basins will have inlet slide gates for isolation.

The immersed membranes separate the solids from the MBR effluent, called permeate. A slight vacuum will be applied to the permeate header by a centrifugal pump. Treated wastewater will then be drawn through the membrane and flow through the center of the membrane and through to connecting tubing to the permeate header. In turn, the permeate will flow through the pump to the downstream processes.

The permeate flow is very high quality effluent. As a result of the small membrane pore sizes, ultrafiltration of the wastewater results in typical permeate turbidity values of less than 0.1 NTU. The membranes also effectively filter out some bacteria and thus provide a degree of disinfection. Results at operating plants show permeate coliform counts typically less than 23 MPN per 100-mL without additional disinfection. Often the MBR permeate coliform totals are less than 2.2 MPN per 100-mL.

The mixed liquor in the membrane zone will be agitated by a coarse bubble diffuser system. The membrane agitation air provides a scouring velocity along the membranes required to prevent a buildup of solids at the surface of the membranes. Four (4) separate positive displacement blowers, which will be located in the blower building, will supply the membrane agitation air.

To maintain performance, the membranes require a "rest" period where flow through the membranes is stopped allowing the membranes to relax. This rest cycle is fully automated and is typically done on a cycle of 15-20 minutes on and 2 minutes of rest.

The membranes may need to be cleaned periodically through backwashing to prevent plugging or fouling of the membrane surfaces, which increases the transmembrane pressure through the membranes resulting in diminished permeate production. The method of backwashing is operator selected and is fully automated. Backwashing requires the use of permeate containing a high chlorine concentration to be pumped back through the membranes on a regular basis. Sodium hypochlorite will be used to dose stored permeate in a backwash tank. This solution will then be pumped back through the membranes in the reverse direction to the permeate flow. This backwash operation will occur approximately once or twice every day. Once or twice a year the membrane cassettes will be taken off-line and undergo a clean-in-place cycle. The clean-in-place begins by draining the membrane tank. The membranes are then backwashed with a chlorine solution, which fills the membrane tank. The membranes are allowed to soak. After soaking, the membrane tank is drained and refilled with mixed liquor and the membranes are placed back into service.

Solids will be retained in the membrane tank and will be continuously recycled back to the anoxic zone to maintain the biomass concentration in the system and also to undergo denitrification. This recycle flow is low in ammonia but high in nitrates. The nitrates in turn provide the denitrifying bacteria in the anoxic zone with an alternate oxygen source to promote denitrification of the wastewater. The recirculated mixed liquor from the membrane basins is typically high in dissolved oxygen. Since this dissolved oxygen will suppress the denitrification process it must be lowered. The de-oxygenation basin receives the mixed liquor prior to the anoxic basin. The dissolved oxygen is lowered in the de-oxygenation basin through endogenous respiration. The mixed liquor is kept in suspension by submersible mixers provided for each basin. From the de-oxygenation basins, the mixed liquor flows by gravity into the anoxic basins.

9.1.2.7. MBR Process Equipment Area

The MBR process equipment, which includes the permeate pumps, backpulse pumps, backpulse tank, valves, flow meters and associated controls and instrumentation, will be located in a building adjacent to the MBR basins. This building is described in a later section.

9.1.3. Disinfection

It is recommended that the effluent to be sent to the percolation beds receive no additional disinfection. The ultrafiltration membranes remove a large portion of the bacteria present. Coliform levels in the MBR effluent are usually low (typically <23 MPN/100mL). The EPA Design Manual for Land Treatment of Municipal Wastewater concludes that wastewater applied to rapid infiltration or percolation beds does not require disinfection. Chlorination may present a problem with formation of chlorinated organic compounds. It is recommended that the MBR effluent be applied directly to the percolation beds without further disinfection.

Disinfection of the portion of the MBR effluent used for recycled water will be accomplished by chlorination. The chlorination system and contact basins will be designed to meet Title 22 disinfected tertiary recycled water requirements. With respect to Title 22, two conditions must be met:

1. The filtered wastewater has been disinfected by either:

   (i) A chlorine disinfection process following filtration that provides a CT (the product of total chlorine residual and modal contact time measured at the same point) value of not less than 450 milligram-minutes per liter at all times with a modal contact time of at least 90 minutes, based on peak dry weather design flow; or

   (ii) A disinfection process that, when combined with the filtration process, has been demonstrated to inactivate and/or remove 99.999% of the plaque-forming units of F-specific bacteriophage MS2, or polio virus in the wastewater. A virus that is at least as resistant to disinfection as polio virus may be used for the purposes of the demonstration.

2. The median concentration of total coliform bacteria measured in the disinfected effluent does not exceed an MPN of 2.2 per 100-mL utilizing the bacteriological results of the last seven days for which analyses have been completed and the number of total coliform bacteria does not exceed an MPN of 23 per 100-mL in more than one sample in any 30 day period. No sample shall exceed an MPN of 240 total coliform bacteria per 100-mL.

9.1.3.1. Chlorine Contact Basins (CCB)

Permeate destined for recycled water production will flow to the CCB, which will consist of a rapid-mix chamber, an inlet distribution channel, two chlorine contact basins, and an effluent wetwell. The CCB, shown in **Figure 9-6**, was designed to provide operational flexibility. Permeate can be split between the two CCBs or a portion of the flow could also bypass the CCB if necessary. The wetwells can be operated separately or combined since the divider wall in the wetwell will have an overflow weir and an interconnecting sluice gate.

Permeate will enter the rapid mix structure where sodium hypochlorite will be added through a PVC pipe header. This structure will be equipped with an induction type chemical flash mixer. Flow will enter the mixing chamber through a pipe penetration. Sodium hypochlorite will then be injected into the flow stream through the mixer. The chemical flash mixer will evenly disperse the hypochlorite. The submersible induction mixer will be fabricated of stainless steel and will be mounted below the chlorine contact basin cover. An access hatch will be provided for removal of the unit for maintenance.

After chlorine injection and mixing, the flow will continue through the CCB influent distribution channel. This channel will be equipped with slide gates to direct the flow to either one or both of the CCBs. The CCB will consist of a concrete basin with concrete baffle walls used to create a serpentine flow pattern. Each basin will be 8 feet wide with a side water depth of 9 feet and 2 feet of freeboard above the normal water level.

The CCBs will each have five passes to create the serpentine flow and will be further configured with a bypass pipe around the basin. The length of each pass will be 87 feet. This layout with both basins in service will provide a minimum hydraulic detention time of 120 minutes at 5.5 MGD. With only one basin in service the detention time for 2.8 MGD will be 120 minutes and 90 minutes for 3.75 MGD. The length to width ratio of the CCB is 54:1.

The CCB floor will be constructed with a cross slope to a drainage channel that will allow the basin to be drained for maintenance. The water surface level in the CCB will be set by the use of a fixed weir on the outlet of each basin. Water will flow over the fixed outlet weir into an effluent pump station wetwell for distribution to disposal or reuse. The contact basin will be covered to prevent degradation of chlorine residual by sunlight and to prevent algae growth. The basin cover material will be fiberglass. Access hatches will be provided for maintenance and cleaning.

Sampling pumps will be used to withdraw samples from the CCB to the chlorine residual/ oxidation-reduction potential (ORP) monitoring equipment. The chlorine residual and ORP will be monitored at the influent end of the basin. The influent chlorine residual and ORP will be monitored to insure adequate chlorine has been added and will also be used to detect a chlorination system failure. The effluent chlorine residual will be monitored to insure compliance with Title 22 CT requirements for recycled water disinfection. The chlorine residual analyzers will be mounted adjacent to the CCB. Signals from the analyzers will be incorporated into the plant control system and SCADA system. These signals will be used to generate alarms to warn the operators of chlorination system failures or malfunctions.

Future expansion would be accomplished with the addition of a new chlorine contact basin, chlorine injection systems, and chlorine analyzers.

9.1.3.2. Chemical Feed and Storage

A building for the chemical feed systems and chemical storage area will be required. A layout plan and section illustration is shown in **Figure 9-7**. Sodium hypochlorite will be used for the MBR backpulse and membrane cleaning operation as well as for effluent disinfection. The MBR manufacturer also requires the use of citric acid for membrane cleaning because of the hardness of the water. Additionally, methanol or ethanol will be required for supplemental carbon addition in the post-anoxic zone.

Chemical metering pumps will be provided for the effluent disinfection. Peristaltic pumps are recommended for hypochlorite delivery since these pumps could accurately deliver the chemical required and are not prone to off-gassing problems that could affect diaphragm feed pumps. Maintenance of peristaltic pumps will be relatively simple compared to diaphragm pumps and will consist of periodic replacement of the pump tubing. This is typically done on a routine basis and requires only a few minutes. The peristaltic chemical feed pumps will use variable-frequency drives (VFDs) for automatic control of the hypochlorite dosage rate.

Programmable logic controllers (PLCs) will control the speed of the pumps based on the CCB influent flow and the chlorine residual detected in the CCB. The pumps will be housed inside a concrete block building. The building will be heated to prevent freezing and equipped with ventilation fans to provide fresh air and minimal heat rejection. No air conditioning will be required for this building.

Sodium hypochlorite will be stored in a high-density, linear polyethylene (HDLPE) chemical storage tank. The tanks will be sized to provide approximately 8 days of storage at peak daily flow chlorine dosage. The storage area will be located outdoor under a canopy. An emergency spill containment area will be provided. The emergency spill containment area will also be included at the chemical metering facilities. A chemical loading station will be provided for chemical truck delivery. Emergency eyewash and shower will be provided inside the building and in the storage area. Hose bibs and hose racks for washdown will also be provided.

Methanol or ethanol will be stored in a double contained aboveground steel storage tank. Since methanol and ethanol are flammable, the storage and chemical pump area will be designated as a Class I, Division 2 area per NFPA 70 (National Electric Code). This will require special construction of electrical components to reduce the risk of fire and explosion. A containment area for the chemical pumps will be provided. All methanol/ethanol feed piping will be double contained. The methanol/ethanol tank will store approximately 3,000 gallons of chemical. The feed pumps will be magnetically driven gear pumps with explosion proof variable speed drives.

9.1.4. Effluent Facilities

9.1.4.1. Plant Water Pump Station

Chlorinated water from the CCB will flow into the effluent wetwell where vertical turbine pumps will provide non-potable water for in-plant use. A wall will be used to divide the plant water pump station from the rest of the wetwell. This wall will have an overflow weir to allow excess water to spill into the remaining wetwell area. A sluice gate will be provided to allow the common use of both sections of the wetwell. The wetwell will be designed for the addition of future pumps. The wetwell will be equipped with an overflow weir. This weir will be set up to overflow and direct water to effluent storage.

9.1.4.2. Effluent Pump Station

Effluent will be pumped by the permeate pumps from the MBR facility through the CCB to the effluent pump station. From here the effluent will be pumped to offsite disposal or directed to the seasonal storage reservoir. The permeate flow can also bypass the CCB and flow directly to the onsite percolation beds. The effluent pumps will be vertical turbine pumps with VFD speed control. The pump station will consist of two duty pumps and one standby pump. The pumps will be sized to provide approximately 3,000 gpm each. The pump station will be provided with an overflow and pipeline to convey flow to the existing onsite percolation beds. The pump station will also be designed to overflow into existing Ponds 1B, 3A and 3B. The effluent pump station is part of the chlorine contact basin structure.

9.1.4.3. Effluent Storage

Existing Ponds 3A and 3B will be converted to provide approximately 11.0 MG of effluent storage. This storage will only serve as equalization or operational storage for use in situations where percolation or effluent disposal is not available. Further effluent storage will be provided in the seasonal storage reservoir (described below).

Existing Pond 1B will be also be designated as effluent storage. Water from Pond 1B can be sent to the existing onsite percolation beds by using the existing pump system. It is not anticipated that the sludge be removed from Pond 1B at this time.

9.1.5. Ancillary Facilities

9.1.5.1. Flow Equalization

Influent flow equalization will not be provided for this project. Since the permeate will be pumped, effluent flow can be controlled to dampen out potential fluctuations in flows to the disinfection and recycled water pump station. By providing additional freeboard in the MBR basins and allowing the level to change achieves built-in flow equalization. The volume of equalization available in the aeration basin is approximately 180,000 gallons. This built-inflow equalization helps reduce the maximum flux rate of the membranes during peak hour flows. Additional equalization is available in the anoxic zones if the levels are allowed to flood these basins.

9.1.5.2. Emergency Storage

The MBR influent distribution structure will be designed to overflow to the SSB in case of emergency. A minimum of 16 million gallons of storage capacity will be available in the SSB for emergency conditions. A decant pump station will be designed to allow pumping of the SSB contents back to the pretreatment facility for processing through the plant.

9.1.5.3. Plant Drain Pump Station

A plant drain pump station will be provided to collect all in-plant building drains, process drains, building sanitary sewers, and storm drainage from the immediate plant site. The plant drain pump station will pump this collected water to the pretreatment facilities upstream of the fine screen channel. This pump station will be a circular wetwell equipped with three submersible sewage pumps. The pumps will be sized for approximately 300 gpm each and will be controlled by discrete float switches or by floats in combination with an analog level device. Foul air from the headspace of the wetwell will be contained and scrubbed through the odor control biofilter to remove odors. The wetwell will have an overflow to direct excess water to the SSB in emergency conditions.

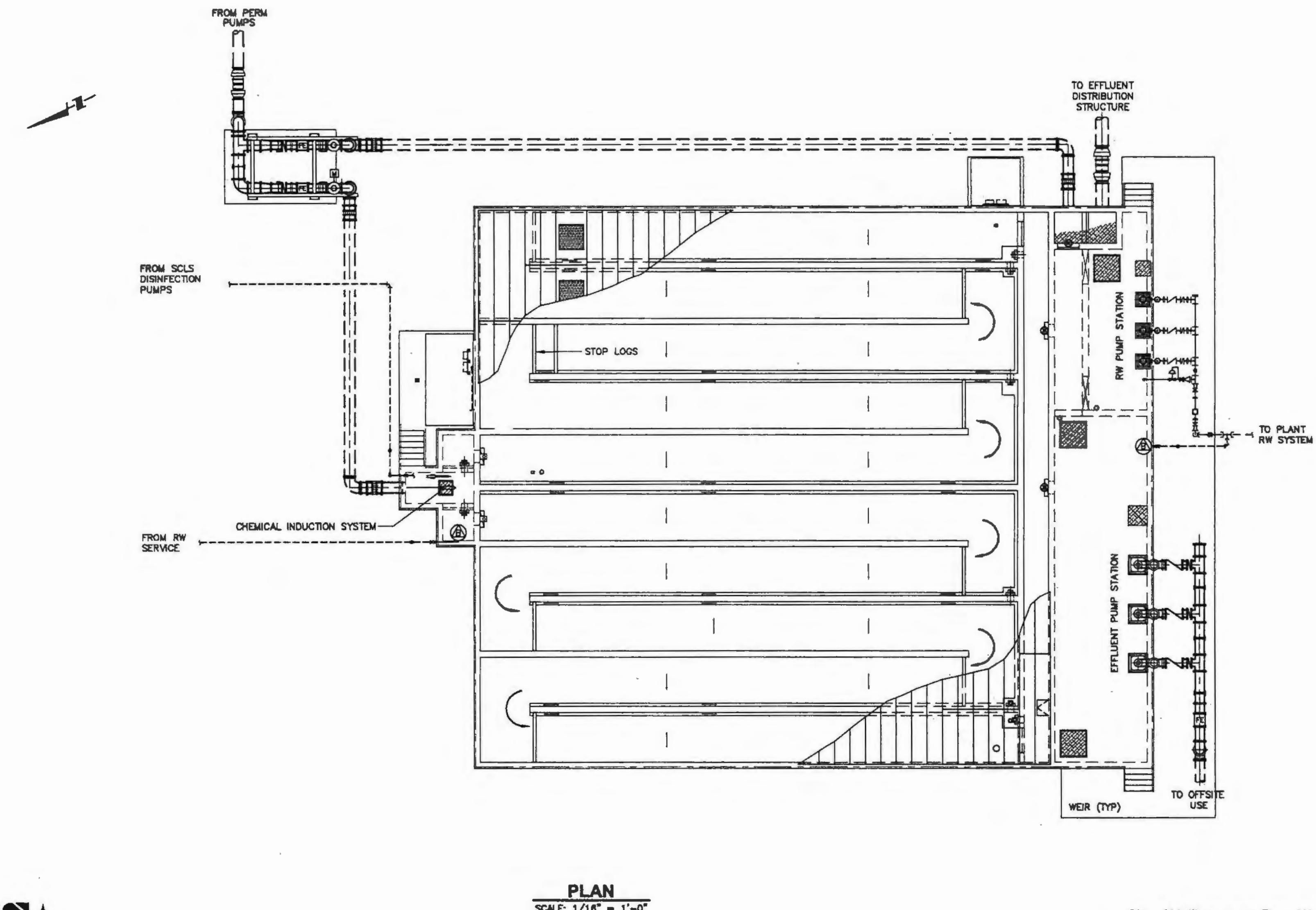


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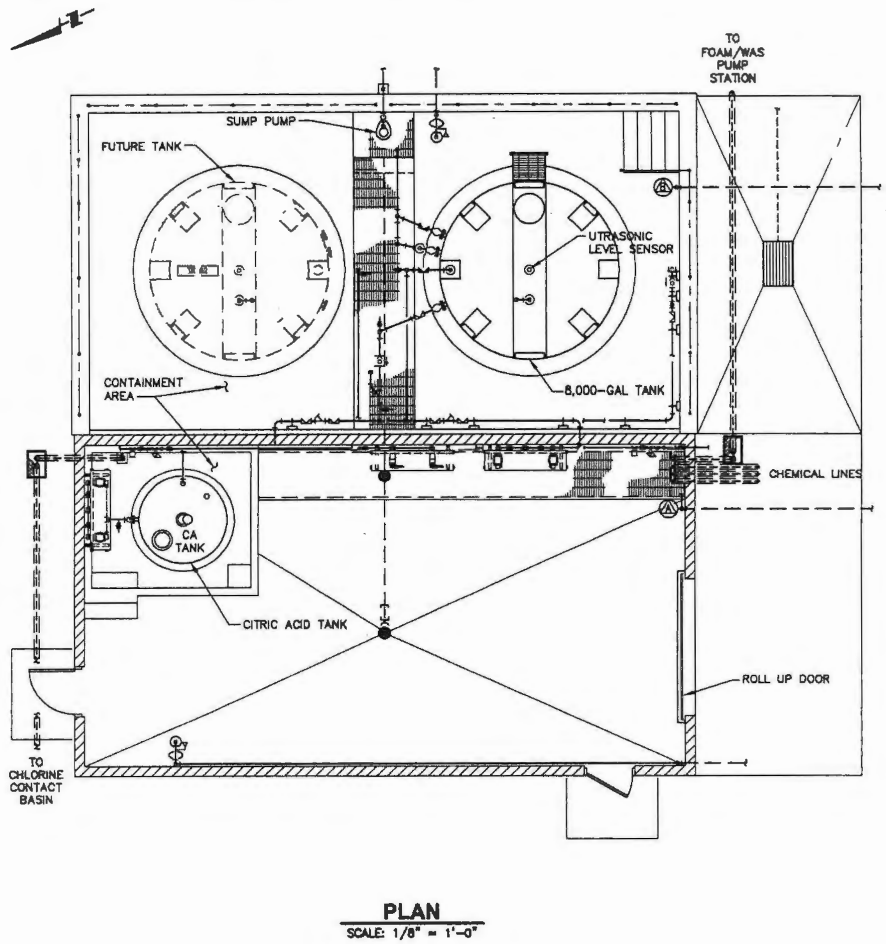
Figure 9-6
City of Hollister Long-Term Wastewater Management Program
Chlorine Contact Basin Plan



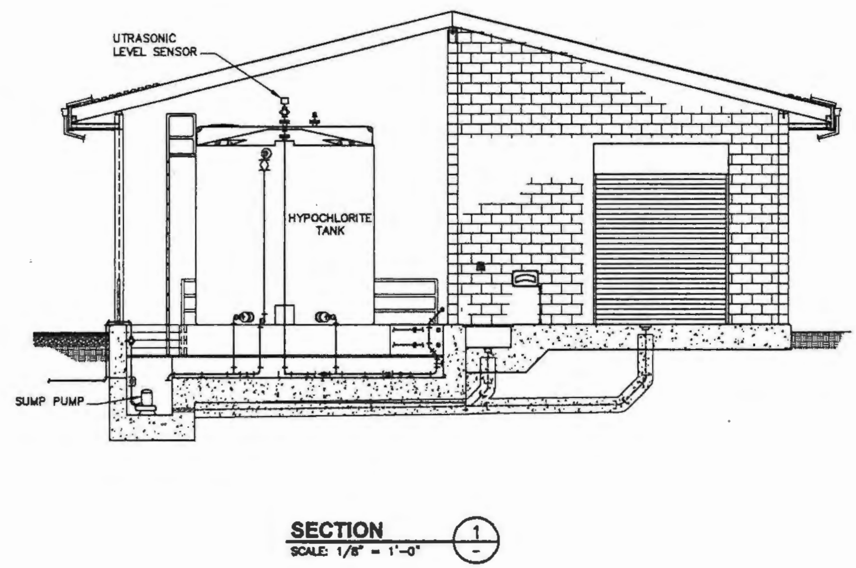


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Figure 9-7
City of Hollister Long-Term Wastewater Management Program
Chemical Building Plan & Section

9.1.5.4. Septage Receiving Station

A septage receiving station will be included in the project. The septage station will be located in the vicinity of the plant entrance. The station will consist of a coarse screen and a concrete containment pad for washdown and dumping of non-hazardous, septic waste. The septage will be accumulated in two holding tanks with a volume of 14,000 gallons each. The holding tanks will be manually drained into the influent lift station for processing through the plant. The operator will have control of the timing of the holding tank draining cycle. The septage receiving station will be fenced and equipped with a cardlock system capable of preventing unauthorized dumping and providing billing information.

9.1.6. Solids Handling

It is estimated that the MBR process will generate approximately 12,400 pounds dry weight of solids per day at the design flow of 5.0 mgd. This waste activated sludge (WAS) is at a concentration of approximately 1.0 percent dry solids by weight. This amount of WAS equates to approximately 150,000 gallons per day of sludge. The sludge will be placed into a sludge stabilization basin (SSB). The sludge settles to the bottom of the SSB where stabilization occurs under anaerobic conditions. This stabilization reduces the volatile solids content and the volume of the sludge. The upper, clearer water is kept aerobic in order to prevent odors. When the SSB eventually fills, the sludge will have to be removed, dewatered and hauled offsite for disposal or beneficial reuse.

Since the MBR mixed liquor generally does not settle well, the plant will be designed to allow optional thickening of WAS prior to being pumped to the SSB. By thickening the WAS to approximately 5-6 percent dry weight solids, the volume of the WAS pumped to the SSB will be reduced by about 70 percent. The additional benefit is that the sludge will have formed a floc particle that will exhibit good settling characteristics in the SSB.

WAS thickening will be accomplished by a gravity belt thickener. Thickened WAS will be pumped to the bottom of the SSB using a progressive cavity pump. Pond 1A will be converted into the SSB by removing the floating baffle curtains and adding solar circulators. The solar circulators will provide the primary source of oxygen for the upper water layer in the SSB. The loading on the SSB is calculated to be approximately 16.5 lbs of volatile suspended solids (VSS) per 1,000 square feet per day. Based on the calculated loading and the anticipated waste sludge production, the SSB will have approximately 15 years of sludge storage available. Eventually the SSB will have to be cleaned out and the sludge removed for disposal or beneficial reuse. At that time the City would have the option to construct dewatering facilities or to contract out the removal and dewatering of the sludge. The sludge, which settles to the bottom of the SSB, would be stabilized in the SSB through anaerobic and anoxic decomposition of the sludge.

Solar circulators equipped with a backup electric power supply will provide the primary aeration needed to maintain a 2-3 foot aerobic water cap over the sludge blanket. These solar devices circulate approximately 10,000 gallons per minute in the upper 2-foot layer of water. This solar technology has proven effective for the sludge basins at the Dublin San Ramon Services District (DSRSD). DSRSD reports that odor complaints have ceased and that dissolved oxygen levels are more stabile since switching from mechanical surface aerators to the solar circulators.

Eight (8) existing floating surface aerators will be repositioned to provide supplemental aeration to the top water cap on the SSB. The solar circulators will run continuously. The mechanical aerators will be used periodically to provide additional oxygen if required. The aerobic surface cap eliminates odors coming from the anaerobic decay of sludge on the bottom of the SSB. Aeration will also help break up any foam and scum accumulation on the SSB.

An option for sludge dewatering includes use a 3-belt filter press. The press can be configured to use the gravity belt thickener section alone to pre-thicken the WAS before wasting to the SSB. The belt press can also be operated to provide dewatered sludge. This sludge would have to be removed from the site for disposal.

The advantage of this method is the additional operational flexibility added to the project for solids handling. The disadvantage of this option is that the dewatered sludge may not meet Class B requirements and will need to be disposed of as solid waste.

9.1.6.1. Supernatant Return Pump Station

The SSB will be decanted on a periodic basis and the supernatant returned to the plant pretreatment for processing. The supernatant pump station will consist of two, self-priming, non-clog centrifugal pumps with a capacity of 150 gpm each. The supernatant will be returned to the plant pretreatment upstream of the fine screens. The suction line for each pump will be equipped with a floating decanter on a suction hose to allow decanting to various levels of the SSB.

9.1.7. Buildings

9.1.7.1. Operations Center

A new operations building will be required to house the operations center, computer and SCADA areas, offices, laboratory, toilet and locker facilities, break room, storage and filing rooms, and maintenance areas. The building floor plan and elevation is shown in **Figure 9-8** and **Figure 9-9** respectively. The building will be one-story, masonry structure with a standing seam metal roof. A combination of split-faced and plain block will be used. Interior walls will be metal stud with drywall or masonry. Office space will have a suspended ceiling. Wet areas such as toilet areas, laboratory rooms, and maintenance rooms will have a drywall ceiling. Ventilation ducting will be installed in the overhead space. Air conditioning equipment will be mounted outside on a pad at ground level.

A mechanical room will include the electrical supply for the building, a hot water heater, and deionized water system for the lab. The lab will be equipped with a fume hood, emergency shower, lab casework and counter space, a separate microbiological testing room, and a lab storage room. Special consideration will be given to the HVAC requirements of the laboratory in order to maintain temperatures and other environmental requirements. The laboratory will be designed to meet all California requirements for certified laboratories.

The maintenance area will include workbenches, storage racks, an air compressor and a chain hoist. A dedicated maintenance office will be provided. Rollup doors on either end of the maintenance shop will provide access for vehicles.

9.1.7.2. MBR Equipment/MCC/Blower Building

A building for MBR equipment, motor control centers (MCC), and blowers will be constructed. The MCC/electrical room will house the MCC for all of the plant mechanical equipment with electrical motors and other electrical loads. The MCC sections will include pretreatment screens, grit removal equipment, permeate pumps, blowers, MBR equipment, plant drain pumps, plant water pumps, chlorine mixers, effluent pumps, aerators, operations building and other miscellaneous equipment.

The blower room will house the process and membrane scour blowers required for the MBR process. A common standby blower will be provided for either membrane scour air or process air requirements. Sufficient space will be provided in the blower room for future blowers.

The blowers will be positive displacement blowers housed in sound attenuating enclosures. Acoustical louvers will be provided for air intakes and a roll-up door will provide access for blower and motor maintenance.

The permeate pumps and other MBR equipment will be housed in one wing of the building. The permeate flowmeters, turbidimeters and other instrumentation will be located in this room. The backpulse tank and pumps are located in the courtyard area of the building.

The layout of the MBR equipment building and MCC/blower building and the MBR tanks is shown in **Figure 9-10.**

9.1.8. Electrical and Control Systems

9.1.8.1. Electrical

A new plant electrical utility service will be established to meet the power requirements associated with the new loads from the MBR plant, ancillary treatment processes, other new facilities and portions of the existing interim plant that will be incorporated with the new plant facilities such as the influent pump station. The existing electrical utility service that provides the power for the existing interim plant will remain in service to provide the power requirements associated with the operation of the existing interim plant. Both the new and existing plant electrical utility services will remain operational until the existing interim plant is fully decommissioned. A new standby power system will be provided to meet the full 100% backup power requirements associated with the initial 5.0 mgd facilities, which will include portions of the existing interim plant facilities. The size and location of this generator will be determined during the electrical evaluation during the design process. It is anticipated that the standby power system will consist of a single generator set housed in a sound attenuating enclosure that meets all requirements of the local air quality board.

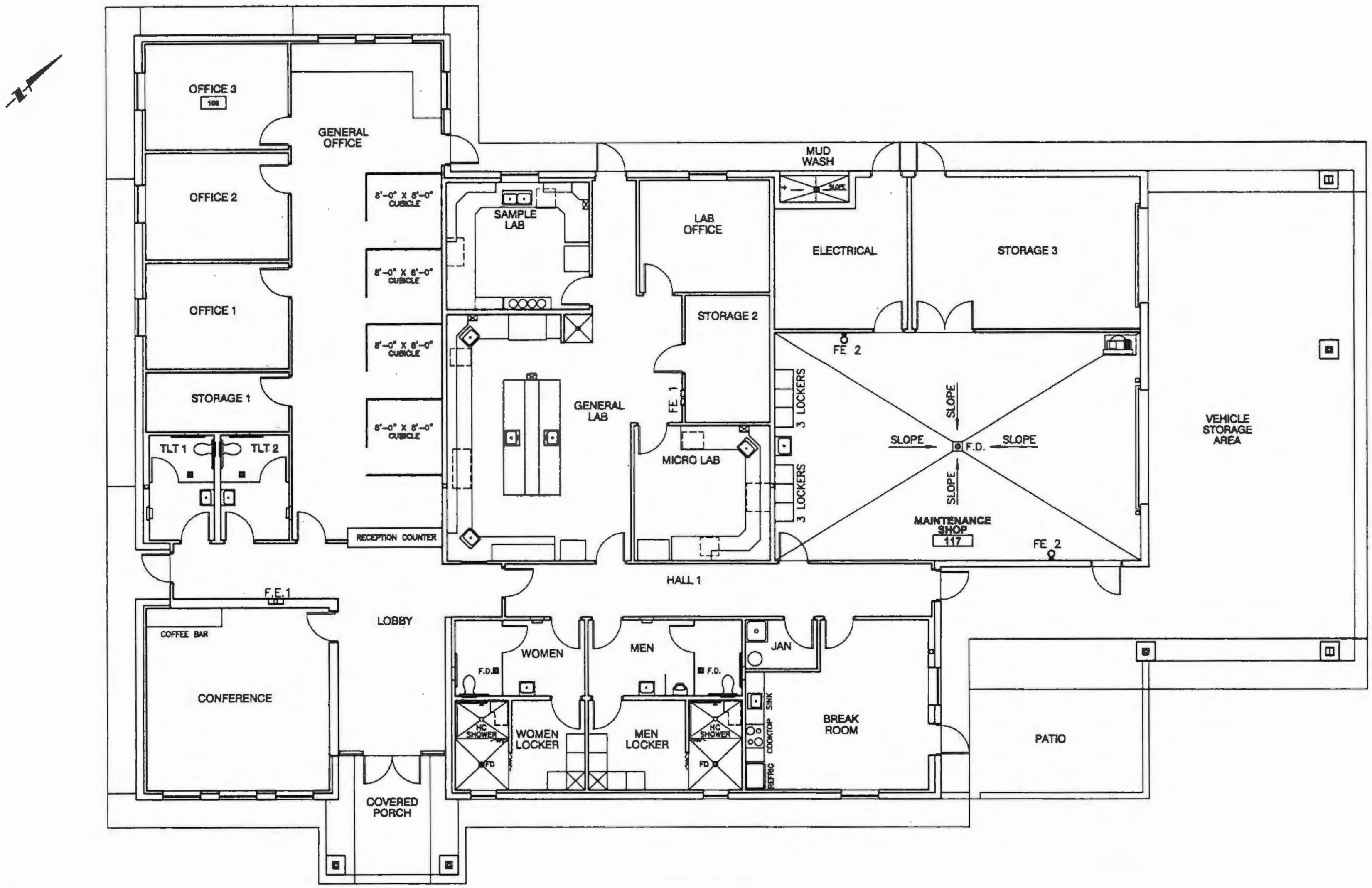
9.1.8.2. Instrumentation and Controls

The existing SCADA system is Wonderware based and monitors and controls the operations of a variety of remote sites. Communication between the remote sites and the SCADA system is radio based and the controls at each site are PLC based using Tesco L2000 and Liq 4 PLCs.

The existing SCADA system consists of two sets of computers. One set of computers resides as the Engineering Office and the other set of computer resides at the City Yard. The two SCADA locations are connected together by means of a Microwave Wide Area Network Link. The SCADA system utilizes Wonderware software and is currently set up to communicate with the Tesco L2000 and Liq 4 PLCs. The interim plant currently utilizes an existing Tesco L2000 PLC to communicate with SCADA but also includes Modicon Momentum PLCs at the Influent and Effluent Pump station. As part of the new plant, the existing set of computers located at the City Yard would be relocated to the new plant Operations Building.

The plant upgrades will include instrumentation and control systems to allow the plant operators the ability to monitor and control the operations associated with the new plant processes, as well, as provide for new SCADA-based control and monitoring of portions of the existing interim plant that will be incorporated into the new plant such as the influent and effluent pump stations.

The plant upgrades will consist of two major control systems – the packaged MBR control system and the general plant facilities control system. There will be an MBR Main Control Panel and a Plant Main Control Panel. Each system will be PLC based and each system will include an operator interface panel that allows an operator to monitor and control the associated plant processes. The two main control panels will be situated next to each other and will allow an



PLAN

SCALE: 3/32" = 1'-0"

Figure 9-8

City of Hollister Long-Term Wastewater Management Program

Operations Building Floor Plan

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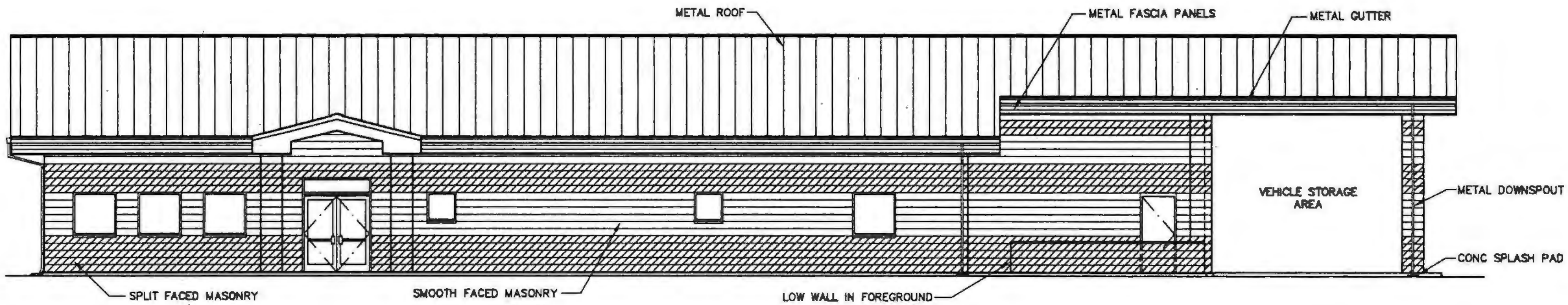
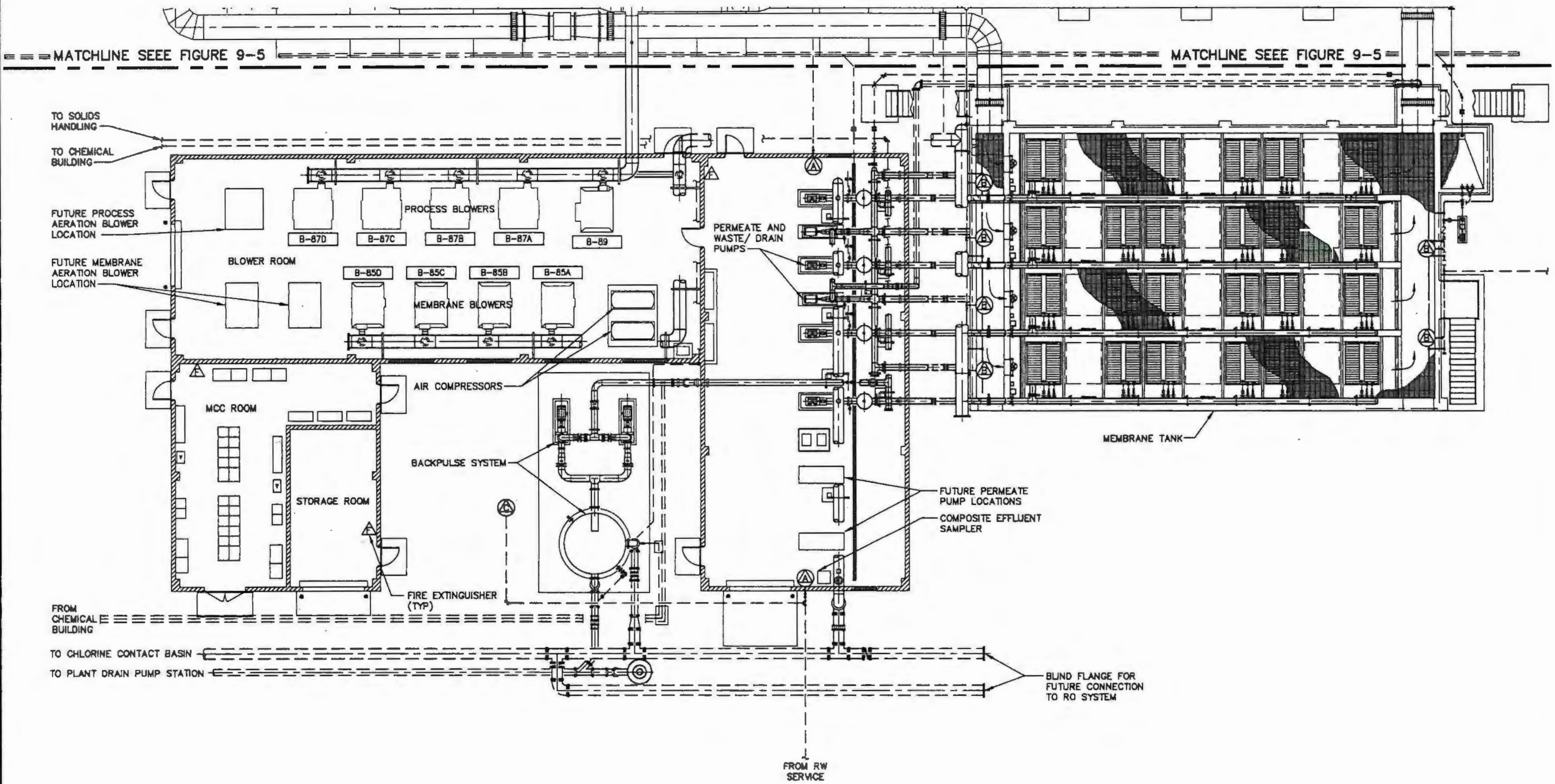


EAST ELEVATION
SCALE: 3/32" = 1'-0"

HydroScience Engineers, Inc.

Figure 9-9
City of Hollister Long-Term Wastewater Management Program
Operations Building Elevation



PLAN

SCALE: 1/16" = 1'-0"

HydroScience Engineers, Inc.

Figure 9-10

City of Hollister Long-Term Wastewater Management Program

MBR Equipment Building Plan

operator to view operations associated with each system simultaneously from the Operator Interface Panels located in each of the Main Control Panels.

In order to maintain the existing communication protocols currently in place at the City, the Plant Main Control Panel will utilize a new Tesco L2000 PLC with a Wonderware based Operator Interface Panel. The new Tesco L2000 PLC will be the plant's primary connection point to the existing City-wide SCADA system. The MBR Main Control Panel will be required to provide a PLC capable of Modicon Modbus communication, preferably a Modicon PLC and will also be

equipped with a Wonderware based Operator Interface Panel. This would allow for a Modicon Modbus communication network that would provide for a connection for the existing Influent Pump Station PLC, the existing Effluent Pump Station PLC, the new MBR PLC and any other new PLCs associated with any pre-packaged control systems such as the fine screens. The Modbus communication network would be then connected to the new Plant Tesco L2000 PLC. This configuration would provide the City's SCADA system direct access to all of the various plant PLCs.

With an existing city-wide Wonderware based SCADA system, the new Operator Interface Panels should also utilize Wonderware based software. The Operator Interface Panels would allow for local operation of the new plant independent from the city-wide SCADA system but would also simplify the integration of the Operator Interface Panel Displays into the City-wide SCADA system. With this approach, plant operations would then be performed locally at the operator interface panels or from any of the existing SCADA workstations. The existing SCADA system would be updated to monitor and control the new plant processes and allow the existing SCADA system to handle data logging, data monitoring and report generation for the new plant.

9.1.9. Geotechnical considerations

Based on site-specific geotechnical report findings, it was determined that liquefaction during a seismic event was a potential of the underlying soils at the site. The initial geotechnical investigation and report by Earth Systems Pacific (*Geotechnical Engineering Report, Domestic Wastewater Systems Improvements-Phase I.* April 2004) identified the liquefaction potential. Subsequently, additional testing at the site was done and a supplemental geotechnical report was issued. A third-party review confirmed the initial findings by Earth Systems Pacific. The geotechnical report recommended that site remediation to mitigate the liquefaction potential. A technical memorandum was prepared to outline the various alternative approaches available to the City for this site remediation (*Liquefaction and Site Remediation Analysis for the Domestic Wastewater Treatment Plant.* August, 2004). The City elected to construct vibro-replacement stone columns below selected essential structures. These selected structures are the processes in the treatment system required to produce a fully treated effluent. The selected structures that will be supported on the stone columns are:

- Pretreatment facility (screens, grit chamber and building),
- MBR process tanks (influent flow split, anoxic basins, aeration basins and recirculation pumps),
- MBR tanks,
- MBR/Electrical building,
- Chemical building, and
- Operations building.

It was not cost effective to require site remediation under all structures. The structures not included in the list above either have sufficient backup or are facilities that the treatment plant can operate without and still meet effluent requirements. All structures will be designed with flexible pipe connections to minimize potential damage be differential settlement caused by a major earthquake.

9.2. Industrial Wastewater Treatment Plant

Evaluation of the IWTP indicates adequate treatment and discharge capacity to treat current industrial and diverted domestic wastewater. The industrial customer is implementing ongoing source control at the industrial source to mitigate high TDS in the raw industrial wastewater. This eliminates the need for near term improvements to the IWTP unless waste discharge restrictions change or if additional industrial customers are connected. At the time of this report, there are no additional industrial wastewater customers under consideration for connecting to the IWTP.

Adequate discharge capacity currently exists in the IWTP percolation ponds and with the anticipated construction of LTWMP improvements to the DWTP, diversion of domestic wastewater to the IWTP is expected to cease. Once this occurs, percolation disposal demands at the IWTP will be further reduced.

The primary emphasis for improving effluent quality at the IWTP is currently source control. The City is also evaluating the implementation of a Wastewater/Storm Water Separation Project to reduce odors at the IWTP. The sole discharger to the IWTP in the future will continue to be San Benito Foods. The long-term discharge from San Benito Foods is dependent upon the company's continued operation. The ability of the IWTP to meet future effluent quality limitations will continue to be reviewed by the City on an on-going basis. Further improvements or modifications to the IWTP will be addressed once the results of these actions have been assessed.

The City considered consolidating treatment of both domestic and industrial wastewater into one new WWTP. However, adding capacity at a new DWTP to treat high strength industrial wastewater will be expensive and create potential nuisance odors. These costs would be difficult to justify or pass on to San Benito Foods, since the existing industrial plant can already meet their wastewater treatment needs. As a result, the City will continue treating industrial wastewater at the IWTP and will not include capacity for the industrial flow in the new DWTP. If necessary, the City could consider adding industrial wastewater treatment capacity as a future upgrade to the new DWTP.

The Water Resources Association (WRA) is preparing a Hollister Urban Area Water and Wastewater Master Plan, which should be complete in January 2007. As part of the Master Plan, a fate analysis of the IWTP will be included. At that time recommendations for the IWTP will be made. The LTWMP will be amended to include the recommendations for the IWTP. This update of the LTWMP is scheduled for completion in March 2007.

9.3. Effluent Management Projects

This Section presents Hollister's interim and long-term effluent management strategies, known as the Phase I and Phase II Projects respectively. The components of the Phase I Project: seasonal storage and spray fields will be discussed first followed by the Phase II Project components which include source control efforts and the recycled water project.

9.4. Recycled Water Seasonal Storage

The seasonal storage reservoir will provide the City with the capability to store treated effluent from the DWTP during the winter when disposal is limited to subsurface percolation. A seasonal storage requirement of 2,000 AF will be needed to hold the treated effluent produced by the

DWTP during the wet winter months by the year 2023. Refer to **Section 8** for the seasonal storage water balance discussion and calculation.

The 2,000 AF seasonal storage requirements will be met with two reservoirs. A 1,500 AF initial seasonal storage reservoir will be constructed at the site of the existing percolation beds on the west side of Highway 156. The initial seasonal storage constructed during Phase I will provide sufficient storage through the year 2013. An additional 500 AF of seasonal storage capacity will be required to meet the storage requirements for buildout conditions. The future seasonal storage reservoir will be located and constructed at a later date but prior to 2013.

9.4.1. Seasonal Storage Reservoir

The initial seasonal storage reservoir will provide the City with the capability to store treated effluent from the DWTP during the winter when disposal is limited to subsurface percolation. A 1,500 AF initial seasonal storage reservoir will be constructed at the site of the existing percolation beds on the west side of Highway 156 as part of the Phase I Interim Effluent Management Project. A future 500 AF seasonal storage reservoir will be required and will be located as part of the Phase II Recycled Water Project.

The site for the initial 1,500 AF seasonal storage reservoir is relatively flat and its construction will require a combination of below grade excavation and levees around the perimeter. The initial seasonal storage reservoir will encompass an area of approximately 77 acres with a water depth of 22-feet. The final reservoir elevations will be set based upon local groundwater elevations and final soil balance. See **Figure 9-11** for a site plan for the initial 1,500 AF seasonal storage reservoir and **Figure 9-12** for a typical reservoir section. Surplus material generated during construction can be used as fill material in Pond 2 for the construction of the DWTP. A detailed soils balance will be required during the initial seasonal storage design phase.

It is likely that groundwater will be encountered during excavation and the site will require dewatering. The initial seasonal storage reservoir will be lined with a synthetic geomembrane liner such as HDPE or with a clay liner to prevent percolation from the reservoir to the groundwater. A pump station at the seasonal storage reservoir will pump the stored effluent to the DWTP for distribution. The reservoir effluent will be directed either to the DWTP onsite percolation beds or to the effluent pump station, which will pump the effluent to the recycled water distribution system. The City's existing Dissolved Air Flotation (DAF) unit may be installed inline from the reservoir pump station to the effluent pump station to remove algae, if required. Piping will be routed from the DWTP to the reservoir to provide the City with the means to drain and fill the reservoir. A paved levee road will provide the City with access around the reservoir. **Figure 9-13** shows the configuration for a typical pump station for the reservoir. A concrete boat ramp will be constructed in the reservoir for access.

As defined in the California Water Code, Division 3, Part 1, Chapter 2, Section 6025, the initial seasonal storage reservoir will fall under the regulatory jurisdiction of the California Division of Safety of Dams (DOSD).

Key requirements of the Water Code Section 6025 are summarized below:

- Section 6025.5(b) – Requires the City to adopt a resolution, which finds that the ponds have been constructed and operated to standards adequate to protect life and property, and provides that the City shall supervise and regulate the design, construction, operation, enlargement, replacement, and removal of the ponds after the effective date of the resolution.

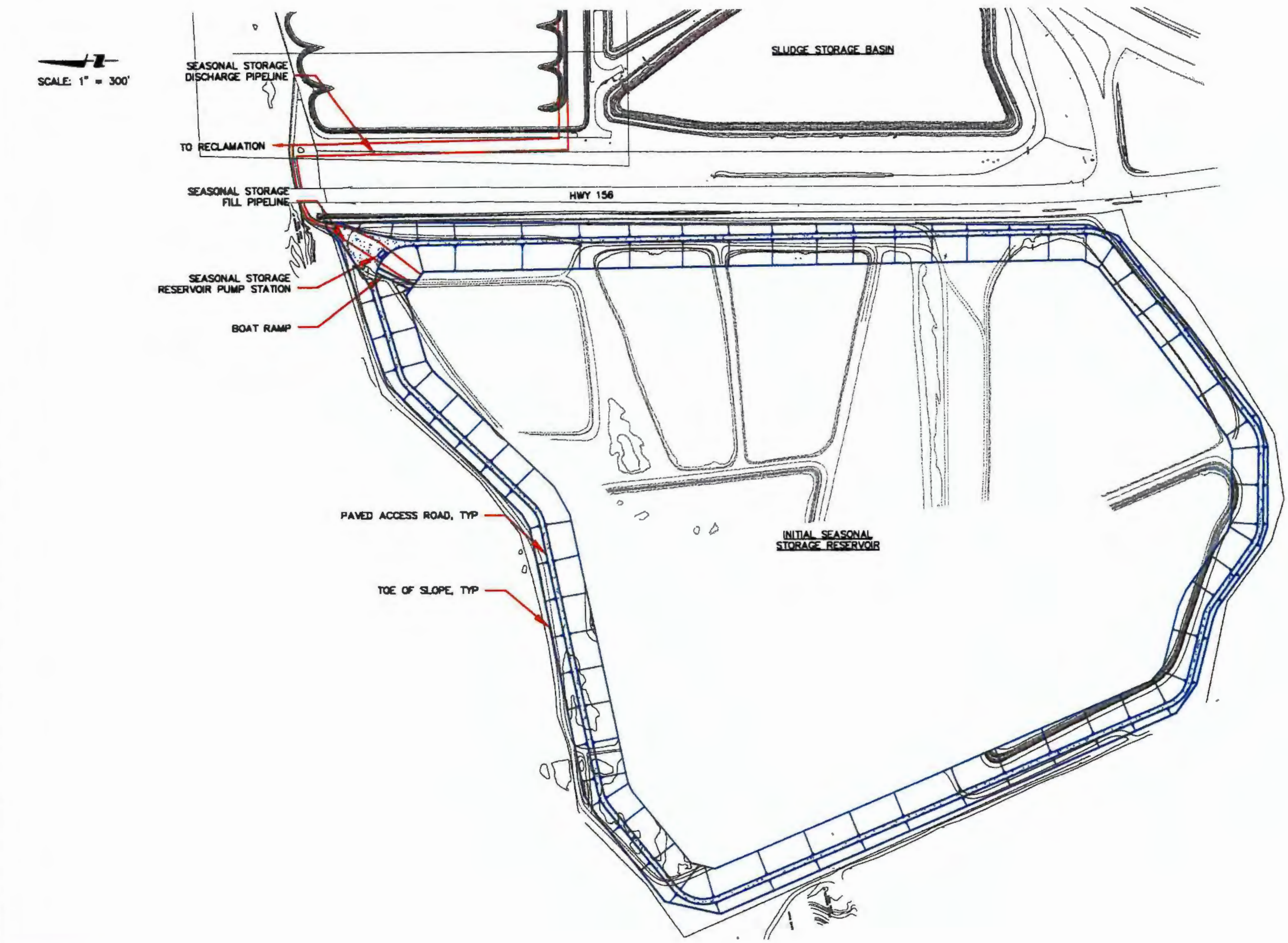


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Figure 9-11
City of Hollister Long-Term Wastewater Management Program
1,500 AF Initial Seasonal Storage Reservoir Site Layout

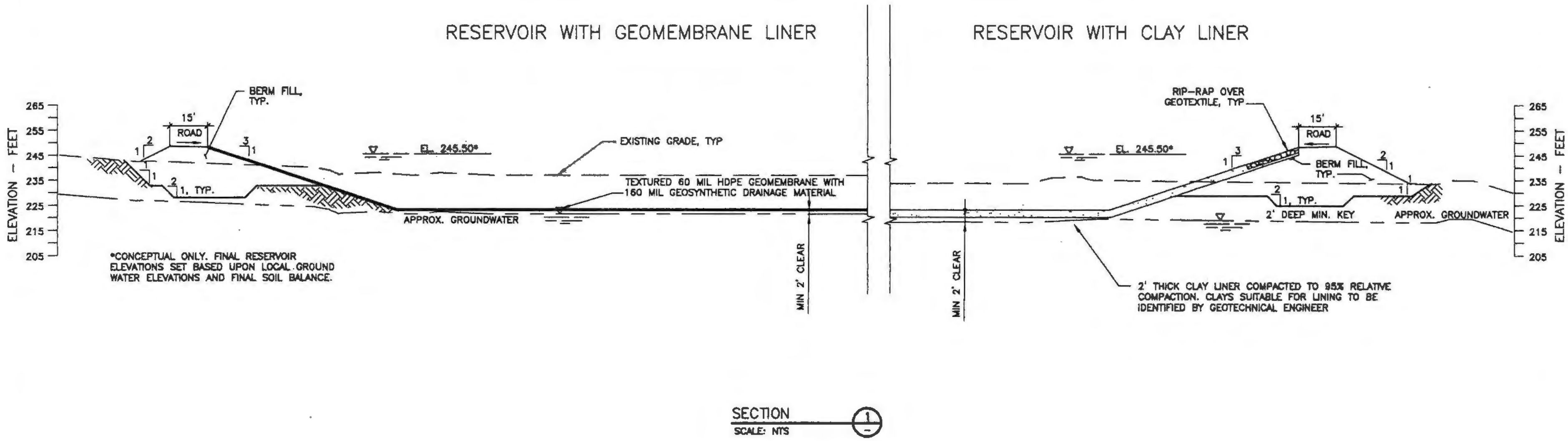

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Figure 9-12
City of Hollister Long-Term Wastewater Management Program
Initial Seasonal Storage Reservoir Typical Section

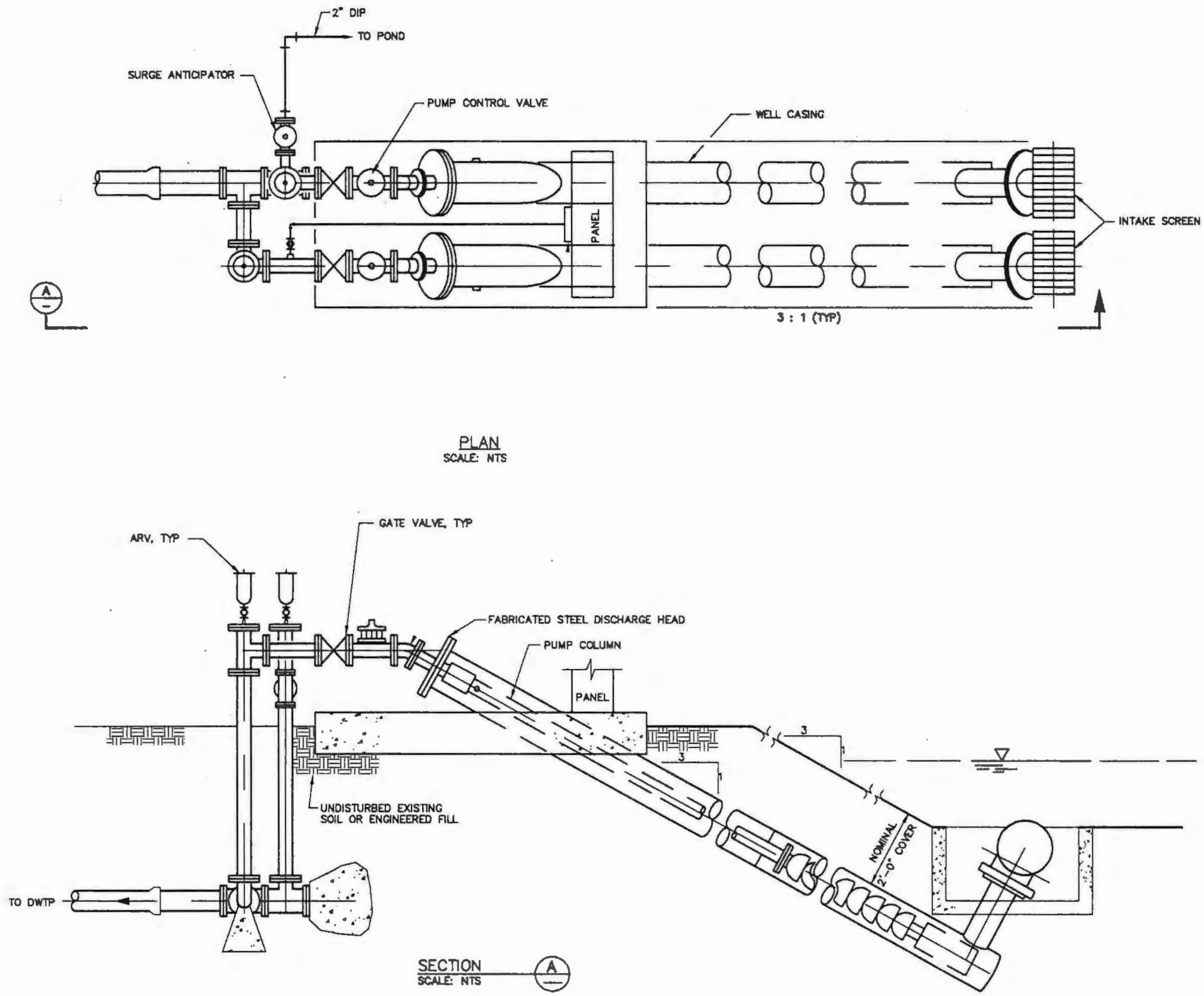

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Figure 9-13

City of Hollister Long-Term Wastewater Management Program

Initial Seasonal Storage Reservoir Pump Station

- Section 6025.5(c) – Requires that the design of the seasonal storage reservoirs be designed by, and constructed under the supervision of a registered civil engineer and the location of the reservoirs not cross a stream channel or water course.
- Section 6025.6(a) – Requires the City to comply with the requirements of Section 8589.5 of the California Government Code, preparation of inundation maps, and employ a civil engineer registered in California to supervise the reservoirs for the protection of life and property for the full operating life of the reservoirs. The City is required to submit the name, business address, and telephone number of the reservoir supervising civil engineer to the Department of Water Resources.

The design of the seasonal storage reservoir shall therefore follow the DSOD's guidelines for the design and construction of small embankment dams. **Table 9-2** summarizes key design parameters for the seasonal storage reservoir.

Table 9-2: Initial Seasonal Storage Basin Design Criteria

Parameter	Value
Initial Seasonal Storage Reservoir	
Volume	1,500 AF
Surface Area	77 acres
Maximum Water Depth	22-feet
Maximum Interior Side Slope	3:1
Access Road Width	15-feet
Geomembrane Liner	HDPE
Geomembrane Liner Thickness	60 mil
Clay Liner Permeability	10^{-6} cm/sec
Clay Liner Thickness	2-feet

9.5. Phase I Interim Effluent Management Project

This Section presents the interim effluent disposal projects known as the Phase I Interim Effluent Management Project. The Phase I Project arose from the need to address planning issues relating to the implementation of a long-term recycled water project. Because the City recognized that the long-term recycled water project entailed complex planning, design and implementation efforts, and formed part of a regional water resource issue involving the City, SBCWD and the County, a Phase I Interim Project had to be developed until a long-term project could be implemented.

The Phase I Project is made up of two components: spray field irrigation and seasonal storage. The spray fields will be utilized during the summer months to dispose of recycled water, and the storage reservoir will provide recycled water storage during the winter months when irrigation is prohibited. The interim spray field project is referred to as the Phase I Project and is described in a Technical Memorandum titled *Draft Phase I Alternative Technical Memorandum* (Draft Phase I Alternatives TM), completed by RMC Water and Environment (RMC) in December 2005. A copy of this document is included in **Appendix G.** The Draft Phase I Alternatives TM mentions that several spray field sites will be evaluated for disposal. The potential spray field sites considered areas in which to dispose of the treated effluent flows derived from the water balance presented in **Section 8** of this Report. The total area of the potential spray field sites considered ranges between 800 and 900 acres. The specific spray field sites will be selected based on several factors including landowner interest, infrastructure costs, feasibility, consistency with the groundwater management plans, adherence to recycled water regulations, and environmental constraints.

9.5.1. Shared Project Facilities

Given that the Phase I and Phase II Projects are closely linked to each other and are dependant upon each other some of the facilities utilized for the Phase I Project will also be utilized for the Phase II Project. Obvious facilities that would be shared include the new DWTP, the seasonal storage reservoir, the percolation beds located to the east of the new DWTP and some of the spray fields utilized during the Phase I Project will continue to be used as recycled water customers come online.

9.5.2. Project Description

The Phase I Project was developed as an interim project. The Phase I Project will provide initial disposal for recycled water until the City's salinity goal is achieved. The Draft Phase I Alternatives TM describes project goals as follows:

Development of the Phase 1 Effluent Management Project off-site disposal options are guided by the goal to identify an off-site disposal project that compliments on-site percolation activities. This project should provide wastewater disposal benefits that encourage public support so that implementation of this aspect of the project coincides with the planned implementation schedule for the overall Phase 1 project (RMC, 2005).

The Draft Phase I Alternatives TM describes the following objectives for the Phase I Project:

- Provide adequate wastewater disposal for a 100-year rainfall year.
- Minimize impacts to existing agricultural land.
- Develop a demonstration project for educational purposes to support a future Recycled Water Project. The demonstration project should be for a predominant crop grown in the area.

As described above, the spray field sites considered for effluent disposal are key, as they will be utilized while the long-term project is being developed.

9.5.3. Project Alternatives

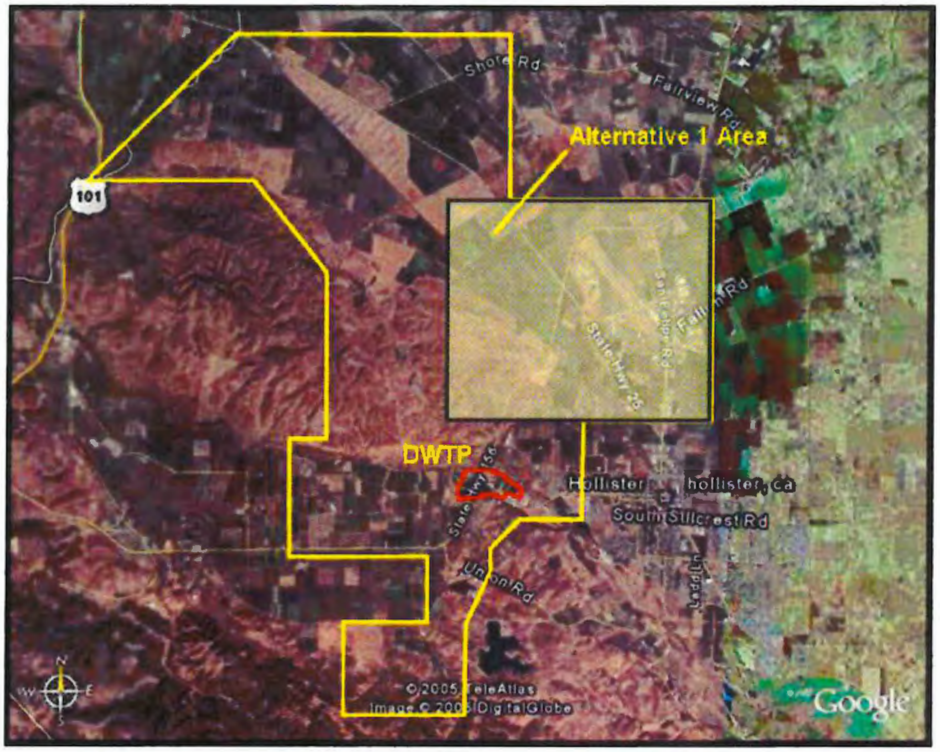
This Section summarizes the three alternatives for the interim project covered in the Draft Phase I Alternatives TM.

Alternative 1 – Northeast Area

The spray field areas identified for this alternative are located to the north and east of the DWTP. The spray field areas are expected to accommodate a water demand of approximately 3,110 AFY during a 100-year rainfall return period (RMC, 2005). A 100-year rainfall return period refers a rainfall event that has 1 in 100 chance or a 1% (1/100) chance of occurring in any given year. The amount of rain projected to fall is based on statistical data collected over several years (USGS, 2005).

The potential spray field area for Alternative 1 is shown in **Figure 9-14**. Specific recycled water customers have not been identified in this area.

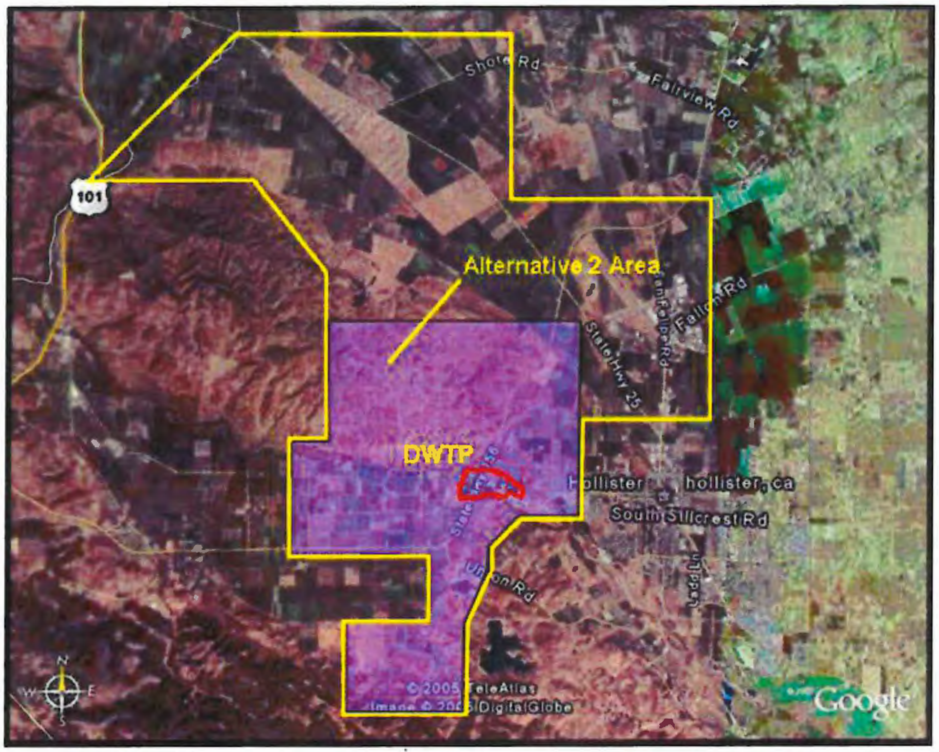
Figure 9-14: Alternative 1 Area



Alternative 2 – Southwest Area

The spray field areas identified for this alternative include areas in the direction of the Freitas Road Area (discussed in **Section 9.8**) located to the north, south, and west of the DWTP. The Freitas Road Area is anticipated to become the one of the first areas that would receive recycled water. This alternative would have an annual total demand of approximately 3,130 AFY. Like with Alternative 1, no specific recycled water customers have been identified in this area. The potential spray field areas and for Alternative 2 are shown in **Figure 9-15**.

Figure 9-15: Alternative 2 Area

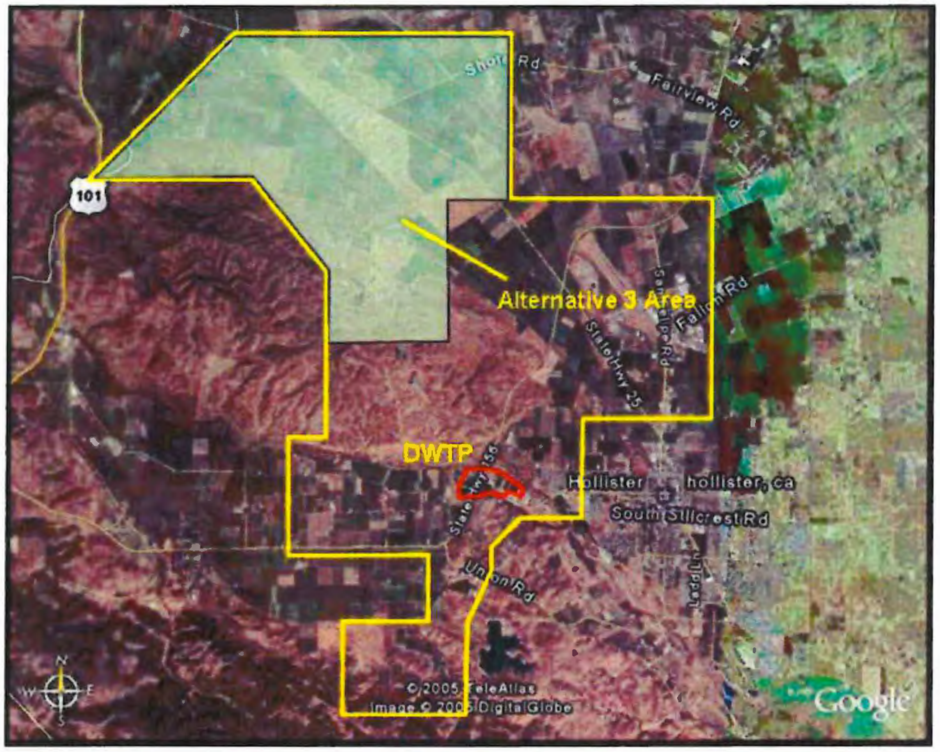


Alternative 3 – Northwest Area

The Alternative 3 project constitutes a project that would provide enough disposal capacity to satisfy the water balance if the existing percolation rates observed at the DWTP are maintained. The spray field areas identified for this alternative are located northwest of the DWTP. The location of these spray field areas was chosen to correlate with the location of a new community that may provide potential recycled water customers. The new community would be located off Highway 25 near the San Benito/Santa Clara County line. It should be noted that the future community may install its own wastewater treatment infrastructure and may have the potential to produce and distribute its own recycled water, which would make this alternative obsolete. The potential spray field areas for Alternative 3 are shown in **Figure 9-16**.

This alternative has a possible water use of approximately 3,005 AFY in the 100-year return period.

Figure 9-16: Alternative 3 Area



9.5.4. Selection of Phase I Project Alternatives

Specific parcels for the Phase I project are not identified at this time. Specific sites will be selected on the basis of landowner interest, infrastructure costs, feasibility, consistency with groundwater management plans, adherence to recycled water regulations, environmental constraints, and other concerns. It is anticipated that the specific Phase I Project will be developed through a public process performed in conjunction with the environmental review process for the project.

9.5.5. Project Costs

The costs for the Phase I Project including the costs for storage reservoir will be presented in **Section 10** of this report.

9.6. Phase II Recycled Water Project

The Phase II Project includes source control efforts, which will be utilized in order to lower the salt content of recycled water to meet salinity goals by the year 2015. Description of the source control efforts begins in **Section 9.7** while the Phase II Project description begins in **Section 9.8.**

9.7. Source Control Efforts

The source control efforts include a series of public outreach measures and potential advanced demineralization technologies that could be utilized to demineralize groundwater and/or recycled water. The following sections detail all of these efforts.

9.7.1. Salinity Control Program

High levels of total dissolved solids (TDS) will not be reduced by the new DWTP MBR treatment system. Dissolved salts and minerals will typically pass through the membranes of the new DWTP. Currently wastewater TDS levels average approximately 1,200 mg/L and range from 1,100 to 1,400 mg/L. Based on wastewater quality data and crop tolerances, salinity control (reduction of TDS) is necessary to provide a recycled water quality that is suitable for agricultural and/or urban use.

The *Hollister Urban Area Water and Wastewater Master Plan Memorandum Of Understanding* (MOU) sets two objectives for the salinity control program:

Section 2.2.2 Sets drinking water TDS concentrations of not greater than 500 mg/L and hardness of not greater than 120 mg/l.

Section 2.2.3 Sets target for recycled wastewater TDS of 500 mg/L and shall not exceed 700 mg/l.

These two objectives are to be met first by source control including, but not limited to, the elimination of on-site regenerating water softeners, and second by demineralization. Section 2.2.3 states that "wastewater treatment plant(s) shall include provision(s) for demineralization." However, demineralization through reverse osmosis treatment or electro-dialysis reversal may also be provided prior to municipal use (well head treatment). The MOU states that these two objectives shall be met as soon as practical and no later then by 2015. For the purposes of the CEQA analysis, the EIR will assume that these goals are met in 2015.

To control TDS levels, the City of Hollister proposes to implement a salinity control program. Salinity control would be achieved by instituting source control programs for municipal and industrial users, and construction of advanced treatment systems to reduce the TDS levels of groundwater or treated effluent. A description of the various proposed controls is provided below.

9.7.2. Salinity Education Program

A salinity education program for agricultural, municipal and industrial users will be implemented to manage salt loads to the groundwater basin. It is estimated that CVP water, fertilizers from agricultural and urban users, and concentration from water softeners from municipal and industrial users account for 53% of all salts entering the groundwater basin (Kennedy/Jenks 2003). The salinity education program consists of assisting agricultural water users in managing salt infiltration to the local groundwater basin. Salinity education of municipal and industrial users will occur primarily through implementation of a water softener ordinance.

9.7.3. Industrial Salt Control in Municipal Wastewater

This program is intended to work cooperatively with food processors and other industrial dischargers whose operations contribute elevated levels of salts to municipal wastewater treatment plants. Salts could be reduced through operational changes that reduce the use of salts, or pretreatment processes that remove salts prior to discharging wastewater into the sewer system.

9.7.4. Water Softener Ordinance

It has been estimated that water softeners add 2,270 tons per year or 6% of the total salt input to the groundwater basin (Kennedy/Jenks 2003). Although this is a relatively small percentage, it is substantial and easily controllable. This program will establish an ordinance requiring new home water softeners to be regenerated off-site to prevent the introduction of salts into the sewer system. Additional components of this program could include a retrofit ordinance applicable to the resale of homes, and a grant program to assist existing homeowners in achieving conversion at lower cost.

9.7.5. Advanced Treatment and Concentrate Disposal

Advanced treatment through reverse osmosis treatment or electro-dialysis reversal could be used to demineralize groundwater or treated effluent. Demineralization of groundwater would reduce salinity and hardness of the municipal and industrial supply, which would result in lower salinity wastewater and subsequent recycled water. Groundwater treatment would involve connection of existing municipal groundwater wells to an advanced treatment system. With the implementation of the groundwater demineralization, the supply of high quality potable water would eliminate the need for water softening. Implementation of this program should reduce TDS levels of the recycled water to between 500 and 800 mg/L. As an alternative, reverse osmosis treatment or electro-dialysis reversal could occur at the DWTP. Advanced treatment at the DWTP would not address the TDS levels in the potable water supply, but would result in meeting the recycled wastewater quality objectives of the MOU.

With the advanced treatment of either groundwater or DWTP effluent, the major challenge is the disposal of the brine byproduct. Disposal of brine could be achieved through construction of an export pipeline to the Watsonville wastewater treatment plant or through the construction of brine evaporation ponds in conjunction with trucking of salts from the groundwater treatment facilities.

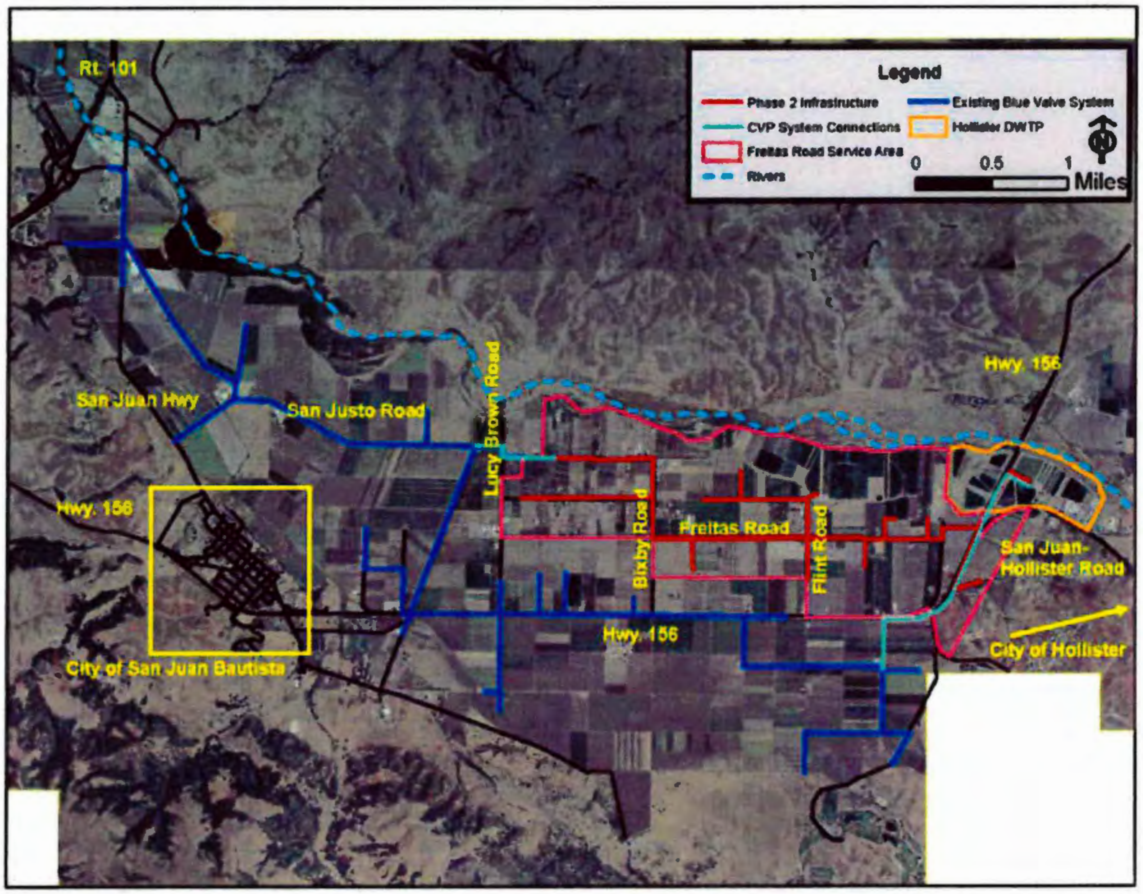
9.8. Phase II Recycled Water Facilities

This Section will provide background information and a summary of the proposed Phase II Project.

A *Draft Regional Recycled Water Project Feasibility Study Report* (RMC Water and Environment, May 2005) was prepared for the Water Resource Association of San Benito County (WRA). The WRA consists of the City of Hollister, SBCWD, Sunnyslope County Water District, and the City of San Juan Bautista. The Feasibility Study developed and recommended an Ultimate Regional Recycled Water Project. The Ultimate Regional Recycled Water Project could potentially distribute approximately 16,320 AFY of recycled water as it comes available to agricultural users throughout the San Juan Valley. The Feasibility Study further developed phased implementation sequencing for the Ultimate Recycled Water Project. Following implementation of the Phase I Interim Effluent Management Project, a Phase II Project was identified to deliver recycled water to agricultural users in the Freitas Road area. The Phase II project area encompasses approximately 1,890 acres and has a total estimated irrigation demand of 4,600 AFY. **Figure 9-17** shows the Ultimate Recycled Water Project for the San Juan Valley including the proposed Phase II Project.

The *San Benito County Regional Recycled Water Project Facility Plan-Draft Report* (RMC Water and Environment, December 2005) evaluated three alternatives for supplying recycled water to users in the Frietas Road area for the Phase II project. The alternatives were differentiated by the level of service they would provide users. The alternatives were evaluated based upon economic and non-economic criteria and a Phase II project was recommended that would supply up to 100% of the irrigation demand in the Freitas Road area. The recommended Phase II Recycled Water Project is shown in **Figure 9-18**. Although the Phase II project is the recommended project in the Facility Plan, the City will evaluate the final project based on economic factors including a cost benefit analysis of including into Phase II the infrastructure constructed during the Phase I project.

Figure 9-17: Ultimate Regional Recycled Water Project



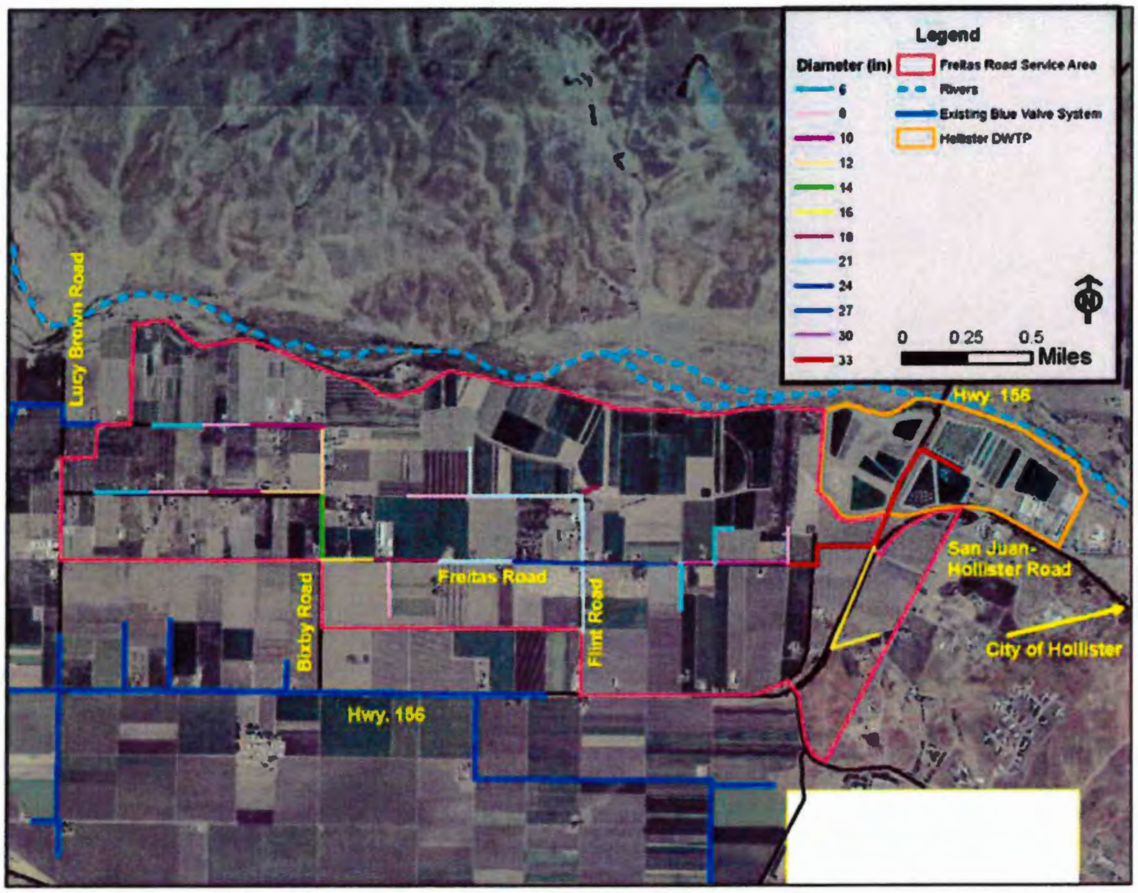
The Phase II project area has an irrigation demand of approximately 4,600 AFY within an area of approximately 1,890 acres. The total demand of 4,600 AFY equates to 100 percent of the projected wastewater flow at the DWTP for the year 2020. The projected wastewater flow through 2023 is 5,041 AFY. Existing percolation beds will provide approximately 895 AFY of supplemental disposal capacity. By combining the 4,600 AFY recycled water demand with the 895 AFY percolation capacity, the City's effluent management/disposal capacity will total approximately 5,495 AFY by 2023. This exceeds the projected wastewater effluent flow in 2023 and is therefore sufficient for effluent management requirements through the City's General Plan planning horizon.

Future phases of the Ultimate Recycled Water Project beyond Phase II will be developed as recycled water supply increases. This expanded recycled water use would require additional modifications to the recycled water distribution system.

9.8.1. Project Funding Sources

Several potential financing options have been identified for the Phase II Project. Funding options include local funding, State/Federal Funding including funding from the SWRCB, and USBR.

Figure 9-18:Recommended Phase II Recycled Water Project



The Facility Plan includes additional details for the potential funding options.

9.8.2. Revenue Sources

As recycled water customers come online, revenue sources would be created of which collection of use fees would be the major source of revenue. Recycled water pricing would be based on several factors including annual projection and benefit allocation analysis. Any remaining costs would be borne by the wastewater and regional supply sectors.

9.8.3. Next Steps

The steps that would need to be taken prior to the final design and construction of a recycled water distribution system include the following:

- Customer assurances, either through mandatory use ordinance or user contracts
- System operations plan
- Temporary and permanent easement acquisition
- Identification of specific funding opportunities.

Upon completion of the above actions, the design phase of the project can begin. The design phase would include surveying, geotechnical investigations, pipeline sizing and alignments, pump station design, and fine tuning of project costs.

9.8.4. Project Costs

The estimated costs for the Phase II Recycled Water Project are presented in **Section 10**.

SECTION 10

LTWMP Project Costs and Implementation Schedule

10. LTWMP Project Costs and Implementation Schedule

Capital and annual cost estimates were prepared for the LTWMP to provide preliminary costs for upgrading the existing DWTP, constructing a seasonal storage reservoir, providing a Phase I effluent management project and providing a Phase II recycled water distribution system. These estimates were prepared in accordance with the guidelines of the American Association of Cost Engineers (AACE). According to the definitions of AACE, the order of magnitude estimate is defined as an approximate estimate made without detailed engineering data. It is normally expected that an estimate of this type would be accurate within +50% or -30%. These percentages should be viewed as statistical confidence limits, and should not be confused with contingencies. The cost estimates shown, and any resulting conclusions on project financial or economic feasibility or funding requirements, have been prepared for guidance in project evaluation and implementation from the information available at the time of the estimate. The final costs of the project and resulting feasibility will depend on actual labor and material costs, competitive market conditions, actual site conditions, final project scope, implementation schedule, continuity of personnel and engineering, and other variable factors. As a result, the final project costs may vary from estimates presented here.

10.1.1. DWTP Estimated Costs

The cost estimates for the treatment plant improvements are based on the actual processes selected for final design. The estimated costs for construction of the DWTP are shown in **Table 10-1**. The facilities included in the estimate are described in **Section 9.**

Table 10-1: Cost Estimate on DWTP Upgrade Alternatives (5.0 MGD)

Description	Membrane Bioreactor ($ thousands)[a]
Paving and grading	$2,722
Demolition	$325
Yard Piping	$3,072
Pretreatment Facilities	$905
Septic Receiving Station	$241
MBR Equipment	$14,422
Chlorine Contact Basin	$1,621
Solids Handling Facilities	$810
Effluent Pump Station	$52
Odor Control Biofilter	$172
Solids Stabilization Basin	$158
Vactor Truck Dump Facility	$32
Chemical Handling Facilities	$299
Plant Water Pump Station	$129
Plant Drain Pump Station	$84
Operations Building	$1,415
Electrical/Instrumentation	$8,395
Liquefaction Mitigation	$2,670
Bonds/Insurance	$700
Submittals	$150
Mobilization/General Conditions	$600
O&M Manuals	$100
CPM Schedule	$5
Testing	$350

Description		Membrane Bioreactor
Sheeting/Shoring		$100
Punchlist		$350
Subtotal		$39,879
Contingency	20%	$7,976
Contractor Overhead & Profit	10%	$4,786
Total Construction Costs		$52,641
Engineering/Administration	10%	$5,264
Construction Management	10%	$5,264
Total DWTP Costs		$63,169

[a] Costs indexed to September 2005 San Francisco Construction Cost Index SF CCI = 8265.45

10.1.2. Phase I Seasonal Storage Reservoir Costs

The cost estimates for the Phase I seasonal storage reservoir is for the 1,500 acre-foot storage reservoir to be constructed on the west side of Highway 156 in the area of the existing percolation beds. The costs include the use and compaction of local clay soils as the reservoir liner. A synthetic membrane liner would add $7 – 8 million to the total project cost. The estimated costs for construction of the Phase I Seasonal Storage Reservoir are shown in **Table 10-2**. The facilities included in the estimate are described in **Section 9**.

Table 10-2: Preliminary Cost Estimate for Phase I Seasonal Storage Reservoir

Description		Phase I Seasonal Storage Reservoir
		($ thousands)[a]
Mobilization/Demolition		$40
Site Prep/Demo/Clean Up		$2,850
Excavate @ Reservoir		$1,740
Place and Compact Fill		$2,620
Haul Surplus to Pond 2		$170
Finish Grade and Compact		$1,900
Install Site Fencing @ 1,500 AC-FT Res		$120
Subtotal		$9,440
Contingency	30%	$2,830
Contractor Overhead & Profit	10%	$1,230
Total Construction Costs		$13,500
Engineering/Administration	10%	$1,350
Construction Management	10%	$1,350
Total Phase I Seasonal Storage Reservoir Costs		$16,200

[a] Costs indexed to September 2005 San Francisco Construction Cost Index SF CCI = 8265.45

10.1.3. Phase I Interim Effluent Management Project Costs

The cost estimates for the Phase I Interim Effluent Management Project are conceptual in nature and are taken from the *City of Hollister Phase I Effluent Management Project, Phase I Alternatives, Draft Technical Memorandum* (RMC Water and Environment, 2005). The estimated costs for construction of three alternatives for the Phase I Project are shown in **Table 10-4**. The three alternatives are presented in **Section 9**.

Table 10-3: Preliminary Cost Estimate for Phase I Interim Effluent Management Project

Description	Interim Effluent Management Project ($ thousands)[a]		
	Alternative 1	Alternative 2	Alternative 3
Distribution System Pumping	$3,690	$4,990	$3,590
Distribution System Piping	$7,670	$5,320	$8,319
Raw Construction Costs[b]	$11,360	$10,310	$11,910
Construction Contingency	$3,410	$3,090	$3,570
Easements	$114	$120	$204
Engineering/Administration	$2,980	$2,700	$3,140
Construction Management	$1,477	$1,340	$1,548
Contractor Overhead and Profit	$1,477	$1,340	$1,548
Total Phase I Interim Effluent Management Project Costs[b]	$20,820	$18,900	$21,920

[a] Costs indexed to September 2005 San Francisco Construction Cost Index SF CCI = 8265.45
[b] Rounded to nearest $10,000

10.1.4. Phase II Seasonal Storage Reservoir Costs

In Phase II, an additional storage volume of 500 acre-feet will be required for the projected flows. Phase II storage costs are preliminary, since the location and site specific soil conditions are unknown at this time. The estimated costs for construction of the Phase II Seasonal Storage Reservoir are shown in **Table 10-3**.

Table 10-4: Preliminary Cost Estimate for Phase II Seasonal Storage Reservoir

Description		Phase II Seasonal Storage Reservoir ($ thousands)[a]
500 acre-foot reservoir		$3,540 – 5,500
Subtotal		$3,540 – 5,500
Contingency	30%	$1,060 – 1,650
Total Construction Costs		$4,600 – 7,150
Engineering/Administration	20%	$920 – 1,430
Construction Management	10%	$460 - 720
Total Phase II Seasonal Storage Reservoir Costs		$5,980 – 9,300

[a] Costs indexed to September 2005 San Francisco Construction Cost Index SF CCI = 8265.45

10.1.5. Phase II Recycled Water Project Costs

The cost estimates for the Phase II Recycled Water Project are conceptual in nature and are taken from the *Draft San Benito County Regional Recycled Water Project Facility Plan* (RMC Water and Environment, 2005). The estimated costs for construction of three alternatives for the Phase II Project are shown in **Table 10-5**. The three alternatives are presented in the Draft Facility Plan.

Table 10-5: Preliminary Cost Estimate for Phase II Recycled Water Project

Description	Phase II Recycled Water Project ($ thousands)[a]		
	Alternative 1	Alternative 2	Alternative 3
Pump Station at DWTP	$2,090	$3,615	$1,075
Backbone Piping	$3,005	$3,949	$6,071
Service Lateral Piping	$1,614	$2,176	$1,614
Turnouts	$500	$500	$500
Raw Construction Costs[b]	$7,210	$10,420	$9,260
Construction Contingency	$2,160	$3,070	$2,780
Easements	$110	$110	$110
Engineering/Administration	$1,900	$2,660	$2,410
Construction Management	$940	$1,330	$1,200
Contractor Overhead and Profit	$940	$1,330	$1,200
Environmental Documentation	$150	$150	$150
Total Phase II Recycled Water Project Costs[b]	$13,410	$17,110	$17,110

[a] Costs indexed to September 2005 San Francisco Construction Cost Index SF CCI = 8265.45
[b] Rounded to nearest $10,000

10.1.6. Total Project Cost Summary

The total estimated project cost for the City of Hollister's LTWMP is summarized in **Table 10-6.**

Table 10-6: Estimated LTWMP Project Costs

LTWMP Capital Construction Costs Description	Capital Costs ($ millions)[a,b]	Engineering/ Admin ($ millions)	Construction Management ($ millions)[c]	Total Project Costs ($ millions)
Domestic Wastewater Treatment Plant	$ 52.64[d]	$ 5.26[e]	$ 5.26	$ 63.16
Phase I Seasonal Storage Reservoir[f]	$ 13.50[g]	$ 1.35[e]	$ 1.35	$ 16.20
Phase I Effluent Management Project[h]	$ 14.86 – 17.23[g]	$ 2.70 - 3.14[h]	$ 1.34 – 1.55[h]	$ 18.90 – 21.92[h]
Phase I Subtotal	**$ 81.00 – 83.37**	**$ 9.31 – 9.75**	**$ 7.95 – 8.16**	**$ 98.26 – 101.28**
Phase II Recycled Water Project[i]	$ 10.57 - 14.90[g]	$ 1.90 – 2.66[i]	$ 0.94 – 1.33[i]	$ 13.41 – 18.89[i]
Phase II Seasonal Storage Reservoir(s)	$ 4.60 - 7.15[g]	$ 0.92 – 1.43	$ 0.46 – 0.72	$ 5.98 – 9.30
Phase II Subtotal	**$ 15.17 – 22.05**	**$ 2.82 – 4.09**	**$ 1.40 – 2.05**	**$ 19.39 – 28.19**
Total Project Cost	**$ 96.17 – 105.42**	**$ 12.13 – 13.84**	**$ 9.35 – 10.21**	**$ 117.65 – 129.47**

[a] Based on September 2005 ENR construction index for San Francisco (SF CCI = 8265.45).
[b] Includes 10% allowance for Contractor overhead and profit.
[c] Construction Management Costs = 10% of Capital.
[d] Includes 20% Contingency.
[e] Engineering/Administration = 10% of Capital.
[f] Reservoir cost estimate assumes use of local clay soils for compacted clay liner. Use of a synthetic liner would add $ 7 – 8 million in total cost.
[g] Includes 30% Contingency.
[h] Cost estimate is range of costs presented in Technical Memorandum (RMC Water and Environment, 2005).
[i] Cost estimate is range of costs from Facility Plan (RMC Water and Environment, 2005).

10.1.7. Estimated Annual O&M costs

The preliminary estimates of the annual O&M costs for the LTWMP are presented in **Table 10-7.**

Table 10-7: Preliminary Annual O&M Costs

Description	Annual O&M Costs ($ millions/yr)
Domestic Wastewater Treatment Plant	$ 3.7
Seasonal Storage Reservoir	$ 0.1
Additional Storage Reservoir	$ 0.1
Phase I Interim Effluent Management Project	$ 0.3 –0.4
Phase II Recycled Water Project	$ 0.1 – 0.4
Total Annual Cost	**$4.3 – 4.7**

10.2. LTWMP Implementation Schedule

Water recycling in one form or another was identified as the only effluent management strategy that met all of the planning and selection criteria of the stakeholders. The Ultimate Regional Recycled Water Project proposed by the Water Resource Association of San Benito County provides the stakeholders with a region-wide plan for water recycling. Full implementation of this project however, can't be accomplished until the City has reduced TDS levels in its effluent to acceptable levels and the recycled water market in the region has been more fully developed.

Because effluent quality and market assurance require additional time to achieve, the City will implement the Phase I Interim Effluent Management Project to reduce effluent percolation into the basin as wastewater flows to the DWTP increase. The use of recycled water to irrigate forage and pasture land has been selected as the best interim project for the City to implement until such time as the Phase II Recycled Water Project can be implemented. It is feasible that some portion of the Phase I Project may be incorporated into the Phase II Recycled Water Project. The Phase I Interim Effluent Management Project will incorporate seasonal storage of recycled water to maximize reuse. It will also include a pilot program to evaluate the feasibility of blending wastewater with imported surface water for use on crops that are more sensitive to TDS than typical forage/pasture crops.

Extensive planning efforts and coordination by the participating stakeholders has contributed to both the knowledge base and policy foundation for managing water resources in the Hollister urban area and northern San Benito County. A key realization derived from this work is that there is not a single, long-term, reasonable, immediately available mechanism to dispose of treated wastewater.

Based on the above considerations, the City of Hollister proposes the following schedule in order to implement a phased recycled water program. The proposed implementation schedule contains milestones for revision and updating of the LTWMP based upon the additional master planning necessary to fully integrate water and wastewater resources to address water quality issues for the basin as well as further development of a local market for recycled water beyond forage and pasture.

10.2.1. Project Schedule

A preliminary schedule with a description of the key milestones for implementing the LTWMP is presented below. This schedule may change due to circumstances beyond the City's reasonable control, such as environmental reviews or delays. A key juncture in the proposed project schedule is scheduled to occur in the spring/summer of 2007. At that time the stakeholders will complete the *Hollister Urban Area Water and Wastewater Master Plan*. That effort will identify integrated work plans for long-term management and quality improvement of wastewater and long-term supply and quality of potable water. The ultimate disposition of the IWTP would also be addressed. Upon completion of the Master Plan, amendments to the LTWMP will be made to incorporate the implementation activities identified in the Master Plan with those identified in the *San Benito County Regional Recycled Water Project Facility Plan*. Additionally, a determination will be made as to whether additional forage/pasture reuse will be necessary prior to full implementation of the Phase II Recycled Water Project.

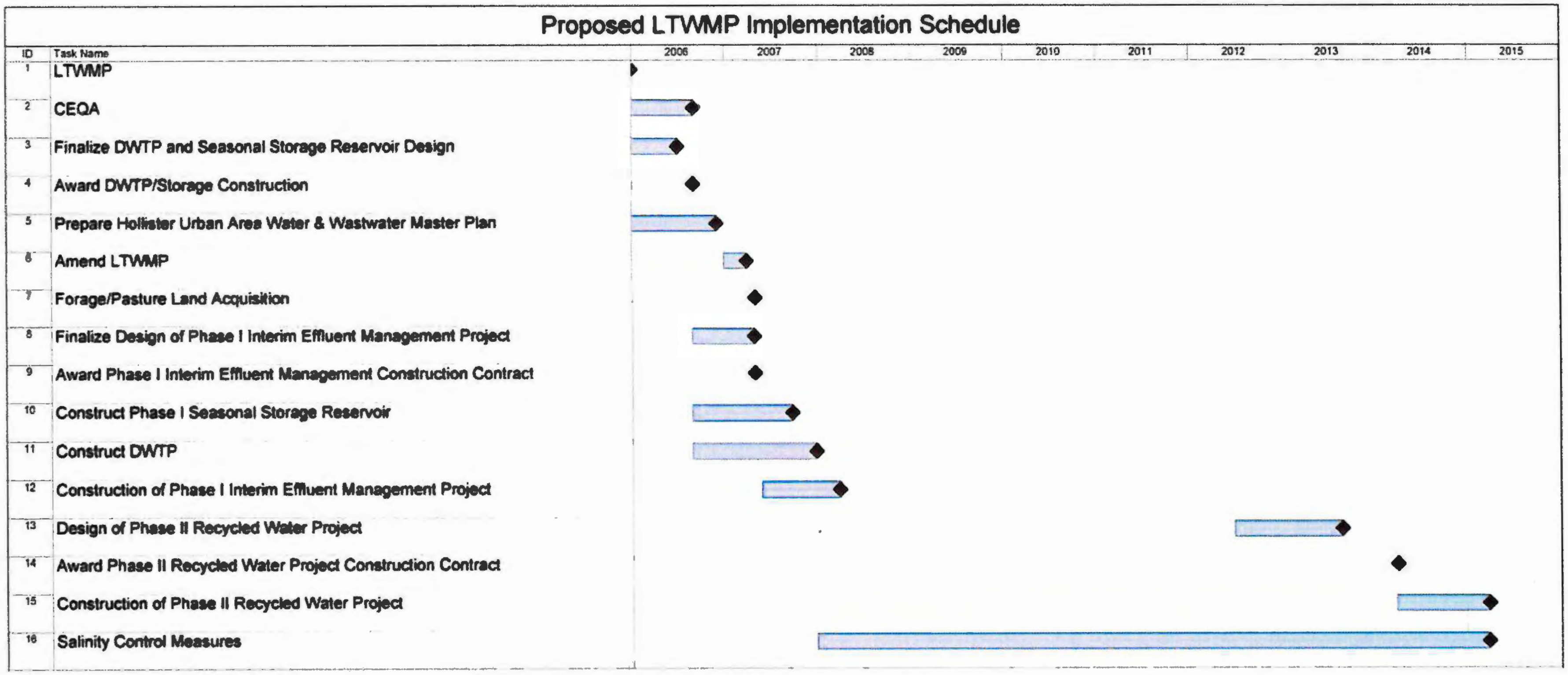
Table 10-8: Proposed LTWMP Implementation Schedule

Activity	Completion Date[a]	Constraints/Comments
LTWMP	December 2005	The LTWMP will be submitted to the RWQCB for review and comment.
CEQA	August 2006	Completion of an Environmental Impact Report (EIR) for the LTWMP.
Finalize Design of Treatment and Storage Facilities	June 2006	Design of the DWTP and Seasonal Storage Reservoir will be finalized in conjunction with completion of CEQA review.
Award Treatment/Storage Construction Contract	August 2006	Award of contract for construction of MBR Wastewater Treatment Facility and the 1,500 acre-foot seasonal storage reservoir.
Hollister Urban Area Water and Wastewater Master Plan	December 2006	Completion of Master Plan which integrates water and wastewater resource management with City and County General Plans and policy guidelines adopted by the City, County and San Benito County Water District.
Amend LTWMP	March 2007	The LTWMP will be amended upon adoption of the Hollister Urban Area Water and Wastewater Master Plan. Specific updates to the LTWMP will include: • Identification of specific actions and timelines for implementing the Phase II Recycled Water Project. • Disposition of IWTP. • Identify water quality improvement actions. • Development of additional forage and pasture land (if required). • Update of the implementation schedule (if required).
Acquisition of Forage/Pasture Land	April 2007	In order to complete construction of the Phase I Interim Effluent Management Project concurrently with the DWTP, additional land must be acquired or leased.
Finalize Design of Phase I Interim Effluent Management Project	April 2007	Design of Phase I distribution, pumping and forage/pasture reuse facilities.
Award Phase I Interim Effluent Management Project Construction Contract	May 2007	Construction of the Phase I Interim Effluent Management Project should be completed by start-up of the DWTP.
Complete Construction of Phase I Seasonal Storage Reservoir	September 2007	The Phase I seasonal storage reservoir must be constructed prior to the 2007/2008 wet weather season because the capacity of the City's percolation ponds will be reduced during construction of the DWTP project.
Complete Construction of the DWTP	December 2007	The construction of the DWTP must be completed by December 31, 2007.

Activity	Completion Date[a]	Constraints/Comments
Complete Construction of the Phase I Interim Effluent Management Project	March 2008	Construction of the Phase I Interim Effluent Management Project Facilities must be complete by the end of the 2007/2008 wet weather season.
Salinity Control Program Complete	2015[a]	Completion date set by MOU.
Complete Design of Phase II Recycled Water Project	August 2013[a]	Design of Phase II Recycled Water Project should be scheduled to facilitate completion of construction of these facilities by March 2015 or earlier if recycled water salinity is sufficiently reduced.
Award Phase II Recycled Water Project Construction Contract	March 2014[a]	Construction of the Phase II Recycled Water Project should be complete by March 2015.
Complete Construction of Phase II Recycled Water Project	March 2015[a]	Completion to coincide with achievement of salinity goals by 2015 (Ref: MOU).

[a] Dates may be amended in March 2007 after completion of the Hollister Urban Area Water and Wastewater Master Plan.

The following schedule graphically shows the proposed implementation plan for the LTWMP for the City of Hollister. This schedule shows the project timelines for the treatment, storage, and interim effluent facilities and project planning.



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HydroScience Engineers, Inc.

Figure 10-1

City of Hollister Long-Term Wastewater Management Program

Proposed LTWMP Implementation Schedule

SECTION 11

References

11. References

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SECTION 12

Abbreviations

12. Abbreviations

AACE	American Association of Cost Engineers
ADF	average design flow, average daily flow
AFY	acre-feet per year
AIPS	Advanced Integrated Pond System
AWWF	Average Wet Weather Flow
ARB	Air Resource Board
bgs	below ground surface
BOD	biochemical oxygen demand
Cal-OSHA	California Occupational Safety and Health Administration
CCR	California Code of Regulations
CEQA	California Environmental Quality Act
City, The	The City of Hollister
Cl	Chloride
CPT	cone penetrometer test
CT	chlorine concentration times modal contact time
CTR	California Toxics Rule
CVP	Central Valley Project
DAF	dissolved air flotation
DBP	disinfection byproduct
DHS	Department of Health Services
DO	dissolved oxygen
DPMC	Dual-Powered, Multicellular
DSOD	Division of Safety of Dams
DWTP	domestic wastewater treatment plant
ELAP	Environmental Laboratory Accreditation Program
ESB	emergency storage basin
°F	Fahrenheit
fps	feet per second
ft	feet
GMP	Groundwater Management Plan
HDT	hydraulic detention time
HAS	hollow-stem auger

hp	horsepower
HSe	HydroScience Engineers, Inc.
HRT	hydraulic retention time
I/I	inflow and infiltration
IWTP	Industrial Wastewater Treatment Plant
L	liter
lbs	pounds
LTWMP	long-term wastewater management program
M&I	Municipal and Industrial
MBR	membrane bioreactor
MCL	maximum contaminant level
MCRT	mean cell residence time
MFL	Million Fibers per Liter, with fiber length >10 microns
mg	milligram
MG	million gallons
MGD	million gallons per day
mL	milliliter
mm	millimeters
MOU	Memorandum of Understanding
MPN	most probable number
NaOCl	sodium hypochlorite
NFSP	Northeast Fairview Specific Plan
NGVD	National Geodetic Vertical Datum
NPDES	National Pollutant Discharge Elimination System
NO_3^-	Nitrate
NOI	Notice of Intent
NTR	National Toxics Rule
NTU	nephelometric turbidity units
O&M	operation and maintenance
OTE	oxygen transfer efficiency
PDR	preliminary design report
PEIR	Program Environmental Impact Report
pg	picogram
PWWF	peak wet weather flow
RAS	return activated sludge

RMC	RMC Water and Environment
ROWD	Report of Waste Discharge
RPA	reasonable potential analysis
RWQCB	Regional Water Quality Control Board
SBR	sequencing batch reactor
SBCWD	San Benito County Water District
SCRWA	South County Regional Wastewater Authority
SIP	State Implementation Policy
SO_4^{-2}	Sulfate
SRT	solids retention time
SS	suspended solids
SSB	sludge stabilization basin
SWRCB	State Water Resources Control Board
TDH	total dynamic head
TDS	total dissolved solids
THM	trihalomethane
Title 22	Title 22, Division 4, Chapter 3 of the California Administrative Code
TKN	Total Kjeldahl Nitrogen
TN	total nitrogen
TSS	total suspended solids
µg/L	microgram per liter
USEPA	United States Environmental Protection Agency
USDA	United States Department of Agriculture
UV	ultraviolet
VFD	variable frequency drive
WAS	waste activated sludge
WDR	Waste Discharge Requirements
WRA	Water Resources Association
WWTP	wastewater treatment plant