1. INTRODUCTION

This chapter provides the background and history of the Napa Sanitation District (District) Wastewater Treatment Plant (WWTP), and includes a discussion of previous master planning work and related documents. It includes an outline of the scope of work addressed in this master plan. Chapter 1 also provides an overview of the existing treatment facilities owned and operated by the District.

1.1 Authorization, Purpose and Scope of Work

The District owns and operates the WWTP located off Soscol Ferry Road in southern Napa County. The WWTP provides primary, secondary and tertiary treatment of wastewater for the City of Napa, California, and portions of the unincorporated surrounding Napa County areas.

The District has identified the need to update its Wastewater Treatment Plant Master Plan (Plan). This Plan updates and replaces the previous Master Plan Update (John Carollo Engineers, May 1990). The Plan evaluates actions required to help ensure that the District has adequate capacity for wastewater treatment through 2030 for the District's service area based on existing population information and projected growth, in conformance with the City of Napa and County of Napa General Plans.

The District has contracted with Brown and Caldwell and Carollo Engineers to complete this Plan. Key scope items include:

- Project Management: Manage, administer and provide ongoing coordination for efficient use of resources.
- Performance Assessment and Operational Review: Review current WWTP operation against the original design intent, especially in light of recent process understanding and current operational requirements, and recommend the best mode of operation prior to stress testing.
- Stress Testing and In-Operation Capacity: Assist the District with ongoing WWTP operations and stress testing to confirm capacity of existing process units (in particular the activated sludge treatment system) and the WWTP as a whole.
- Reliability Criteria: Summarize recommended reliability criteria for WWTP unit processes and compare to current provisions.
- Existing Facilities Description: Describe the existing WWTP and provide an historical overview of WWTP components.

- Flow and Loading Evaluation: Use the applicable planning material provided by the District in its Collection System Master Plan (Winzler & Kelly, October 2007) with linear interpolation for intermediate years to establish planning-level population projections and flows. Historical organic and solids loading data served as the basis to project future loadings.
- Existing and Anticipated Regulatory Requirements: Summarize the opinion formed by a District consultant Oakley Water Strategies regarding anticipated regulatory discharge requirements for the 2011 permit renewal cycle. The Plan uses 2011 requirements as the basis for planning through 2030, but the Plan also recognizes and addresses possible impacts for more stringent effluent ammonia limitations and improvements needed to address such a permit change.
- Capacity Analysis: Determine the capacities based on existing facilities and operations and optimum operation of existing facilities.
- Business Case Evaluation of Viable Alternatives: Help the District develop levels of service that define the WWTP and its operational requirements and possible future options. Use levels of service to develop, evaluate and select the preferred alternative, taking into account economic and non-economic (social and environmental) criteria, energy use, and greenhouse gas emissions and carbon footprint (at a qualitative level). Also, conduct a condition assessment for existing facilities through visual inspection of above-ground components and interviews with District operations and maintenance staff about operational and maintenance history.
- Recommended Implementation of Preferred Alternative: Develop a recommended Capital Improvements Program based on the preferred alternative. Include a recommendation of a phased approach to treatment improvements throughout the planning period, and identify potential key decision points and response strategies to address alternative regulatory requirements. Identify possible flexibility for future regulatory changes. The Plan reflects modifications to reduce ammonia, but does not project major modifications for nitrogen, phosphorus and/or trace constituent removal.

1.2 Planning Period

The 20-year planning period for this document runs from 2010 through 2030, with recommendations for modifications presented generally in yearly increments. For recycled water, the District would construct additional facilities in response to user demands; therefore, the Plan links recommended modifications to the capacity gained with each modification, rather than to projected years. This planning period and projected growth are based on the Collection System Master Plan (CSMP) (Winzler & Kelly, October 2007). The City and County planners provided information on anticipated development used for CSMP projections. The projections are consistent with the City of Napa General Plan (as amended August 12, 2003) and the 1994 Napa County General Plan (as amended) and information from the General Plan Update process as it was in progress in 2007.

1.3 Project History

This Plan replaces the 1990 Master Plan Update, which addressed new developments in wastewater treatment for the District facilities as well as the American Canyon County Water District (ACCWD) wastewater treatment facilities. Events that occurred just prior to 1990, mainly odor management concerns at District and ACCWD oxidation ponds during cold weather and at loadings less than established design criteria, led to the development of the 1990 Master Plan Update. The Update's main recommendation was to construct primary and secondary treatment facilities at the Soscol Physical/Chemical Plant to address the pond odor concerns directly. A similar recommendation was included in the 1988 and 1987 District and ACCWD master plans, respectively. In addition, the 1990 Master Plan Update recommended developing additional District-owned land for recycled water delivery and a Title 22 unrestricted reuse reclamation project to deliver recycled water to address increasing wastewater flows during summer months.

Five alternatives were evaluated in the 1990 Master Plan Update for the new secondary treatment facilities:

- Aerated lagoons
- Trickling filters
- Trickling filter/solids contact
- Activated sludge
- Extended aeration

The District selected the activated sludge alternative to be most viable, based on reduced chemical costs and increased flexibility for nutrient reduction in the future. As a result, the District installed an activated sludge process train at the Soscol Physical/Chemical Plant in 2001 (see discussion in Section 1.4); however, the District also retained its oxidation pond system and has operated it in parallel with the activated sludge system, especially to treat and store peak wet weather flows.

1.4 Treatment Facilities Overview

In 1945, the District was formed as a special district under the California Health and Safety Code. District- wastewater treatment facilities since its inception include the original (now abandoned and demolished) Imola Avenue Wastewater Treatment Plant, the Soscol Oxidation Ponds, and the Soscol Physical/Chemical Plant. Following are summaries of major plant upgrades:

- The Imola Plant was constructed in 1947. Treatment processes included primary sedimentation, trickling filters, and secondary sedimentation prior to discharge to the Napa River. Biosolids were digested and then spread on sand beds to dry.
- In 1965, the District constructed treatment facilities at the end of Soscol Ferry Road that consisted of four connected oxidation ponds covering 342 acres known as the Soscol Oxidation Ponds. Starting in 1965, the ponds treated wastewater from a portion of the District service area and primary effluent from the Imola Plant. Pond effluent was disinfected with chlorine and discharged directly to the Napa River.

- In 1975, the District constructed the Soscol Physical/Chemical Plant, which was jointly owned by the District and ACCWD, to treat oxidation pond effluent. The ponds then received flow from the District service area, the Imola Plant, and effluent from the ACCWD oxidation ponds. The new plant had a permitted capacity of 15.4 million gallons per day. The main function of the plant was to remove algae produced in the oxidation ponds using chemical addition (lime and alum) ahead of flocculating clarifiers. This treatment was followed by chlorine disinfection and sulfur dioxide dechlorination before discharge to the Napa River. Additional improvements in 1975 included dual-media effluent filtration.
- In 1983, the Regional Water Quality Control Board, San Francisco Bay Region, modified the discharge permit to restrict summertime Napa River discharge, during which river flows were thought to be lower. The District complied by storing water in the oxidation ponds during the non-discharge season. The District also acquired land onto which it could deliver treated effluent through irrigation.
- The 1994 Phase 1 upgrade to the Soscol Physical/Chemical Plant included improvements to provide tertiary treatment of wastewater and generate Title 22 recycled water. Phase 1 improvements included adding continuous backwash filters, chemical feed buildings, recycled water storage basins and pump stations. In addition, the original dual-media filter structure was converted to Chlorine Contact Basin (CCB) No.3, and recarbonation basins were converted to the East and West CCBs.
- The 2001 Phase 2 upgrade to the Soscol Physical/Chemical Plant included a new headworks facility and a second process train for secondary treatment using aeration basins and secondary clarifiers. The District also constructed new solids treatment facilities, including a dissolved air flotation thickener (DAFT) for thickening waste activated sludge (WAS), an egg-shaped anaerobic digester, a half-egg sludge storage tank with flexible membrane gasholder, and new belt filter press (BFP) dewatering facilities. Phase 2 improvements also included modifying some existing facilities, such as converting two flocculating clarifiers to primary clarifiers.
- In 2008, since the original aeration diffusers had reached the end of their useful life, the District installed new membranes on the existing aeration panels, replaced two of the three existing centrifugal blowers with new turbo blowers, and installed two new dedicated channel air blowers. The District added the turbo blowers to improve activated sludge system energy efficiency.
- On several occasions over the last 20 years, the District has arranged for sludge removal from Pond 1 of its oxidation ponds. Sludge removal occurred most recently during the summers of 2007 and 2008. The District removed about 61,700 dry tons during this period. The District incorporated this material into soils on District-owned land as a soil amendment.

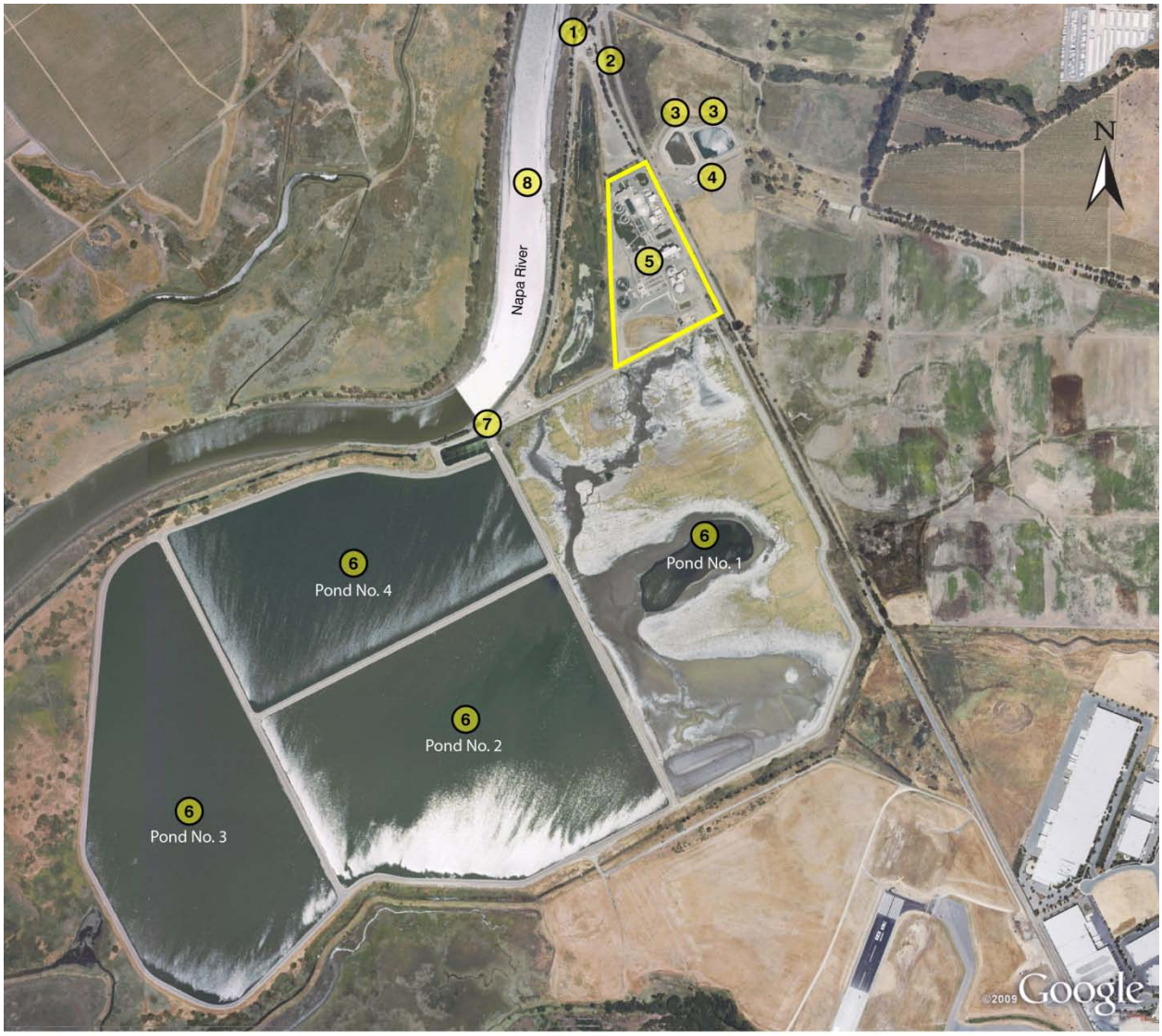
The WWTP generally has operated in its current treatment configuration since Phase 2 modifications were completed in 2001. A headworks facility (consisting of screens and aerated grit removal) provides preliminary treatment; primary clarifiers provide primary treatment. Secondary treatment is accomplished through a 342-acre facultative pond system, an activated sludge treatment system with two parallel process trains, or a combination of both systems

operating in parallel. The filters, followed by disinfection, convert secondary effluent into tertiary effluent for recycled water which is used in Napa and the surrounding area mainly for irrigation. The District also can store effluent in the oxidation ponds and discharge it to the Napa River (in winter months only) after suspended solids removal and disinfection.

The DAFT concentrates WAS prior to anaerobic digestion, while primary sludge is sent directly to the digester after thickening within the primary clarifiers. Primary sludge and WAS are digested in an egg-shaped digester, with recovered biogas sent to cogeneration facilities for energy generation and heat recovery. Following BFP dewatering, biosolids are applied to District-owned land.

The WWTP has two seasonal operation modes: summer reclamation mode and winter river discharge mode. The original WWTP design accommodated these two operational modes as required by the National Pollutant Discharge Elimination System (NPDES) discharge permit, which prohibits river discharge from May 1 through October 31, except for emergency discharges. During the dry weather months, a portion of the influent wastewater is treated for reclamation while the remainder is treated and stored without discharge in the Soscol oxidation ponds. During the winter season, the District discharges to the Napa River in preparation for the next dry season and to accommodate wet weather flows.

Figure 1-1 depicts an aerial view of the entire WWTP site, which includes the four oxidation ponds and the central treatment area. Figure 1-2 shows more details for the central treatment area.



LEGEND

1. Influent Pump Station
2. Manhole No. 9
3. Recycled Water Reservoirs
4. Recycled Water Pump Station
5. Central Treatment Area (See Figure 1-2)
6. Oxidation Ponds
7. Pond 4 Pump Station
8. River Discharge Location

Figure 1-1. District WWTP Site Plan

LEGEND

1. Administration Building/Lab
2. Headworks/Septage Receiving Station
3. Ferric Chloride Storage
4. Primary Clarifiers
5. Primary Diversion Structure
6. Aeration Basin Distribution Structure
7. Aeration Basins
8. Blower Building
9. RAS/WAS Pump Station
10. Mixed Liquor Distribution Structure
11. Secondary Clarifiers
12. Secondary Effluent Pump Station
13. Filters
14. Filter Support Systems Building
15. Chemical Storage Building
16. Sodium Hypochlorite, Sodium Bisulfite and Polymer Storage
17. Sodium Hypochlorite Mix Box
18. East Chlorine Contact Basin
19. West Chlorine Contact Basin
20. Chlorine Contact Basin No. 3
21. Flocculating Clarifiers
22. Solids Handling Building
23. Dissolved Air Flotation Thickener
24. Egg-Shaped Anaerobic Digester
25. Half Egg Digested Sludge Day Tank/Gas Holder
26. Digester Control Building/Access Tower
27. Gas Flare
28. Belt Filter Press Room
29. Maintenance Building
30. Polymer Storage
31. Biosolids Load Out

Figure 1-2. Details of District WWTP Central Treatment Area

1.5 Organization

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