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Technical Memorandum

Prepared for: City of Sunnyvale, California

Project Title: Water Pollution Control Plant Strategic Infrastructure Plan

Project No: 135083.004

Technical Memorandum

Subject: Early Execution Projects

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To: Lorrie Gervin, Environmental Services Manager, City of Sunnyvale

From: Lloyd Slezak, Project Manager - Brown and Caldwell

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1. INTRODUCTION

1.1 Background

Needed improvements at the City of Sunnyvale Water Pollution Control Plant (WPCP) are being evaluated with a Strategic Infrastructure Plan (SIP). The SIP will evaluate overall strategic alternatives for renewal of aged facilities and will recommend a specific plan for executing the selected alternative for facilities renewal. The overarching approach of the SIP is to compare the broad alternative of renovating and optimizing the existing plant facilities against the broad alternative of generally replacing the existing facility with new treatment processes. Within each broad alternative there will be some sub-alternatives considered. The SIP includes a task to identify and consider the need for early implementation of some plant renewal projects in advance of final completion of the SIP. The SIP process of careful and considered decision making, may, in some instances, be in conflict with risks posed by failure or poor performance of existing aged components that could occur during the time the SIP takes its planned course of execution.

1.2 Purpose and Objectives

The purpose of this Technical Memorandum (TM) is to identify and consider the need for early execution of some plant renewal projects in advance of final completion of the SIP. There are a number of drivers indicating the need for early implementation on some plant components. At the same time, it is important to determine that any early execution project be conducted in a way that does not compromise consideration of reasonable alternatives that will be addressed through the SIP. Early implementation projects should only include facilities that:

1. result in the WPCP site still being able to accommodate any of the reasonable SIP alternatives,
2. include a treatment process function that would be reasonably included in any of the reasonable SIP alternatives.

This TM seeks to achieve the following objectives:

- Identify known high priority, high risk process and equipment areas that would be candidates for early execution renewal projects.
- Consider the impact of early execution on the range of possible outcomes for recommended alternatives in the SIP.
- Recommend projects for early execution and address potential project constraints to allow the early execution projects to be coordinated with the ultimate facilities recommended by the SIP.

1.3 Recommendations

The ultimate recommendations of this Technical Memorandum are as follows:

- Repair or replace the headworks, primary sedimentation tanks, grit removal tanks, primary effluent channel, and primary effluent pipe.
- For the primary sedimentation tanks, evaluate in predesign the alternatives of replacement in the current location or replacement in the area currently used for sludge dewatering.
- Provide diesel-fueled standby generators for emergency power.

- Develop a master plan for electric power distribution in order for other early execution design projects to add appropriate components of an ultimate electric power distribution backbone system. This plan should be developed simultaneously with planning for new diesel fuelled standby generators.

2. DRIVERS

There are drivers compelling initiation of early execution projects in advance of normal completion of the SIP. These drivers include: current compromised condition of facilities, regulatory compliance issues, time schedule, and reliability considerations as follows:

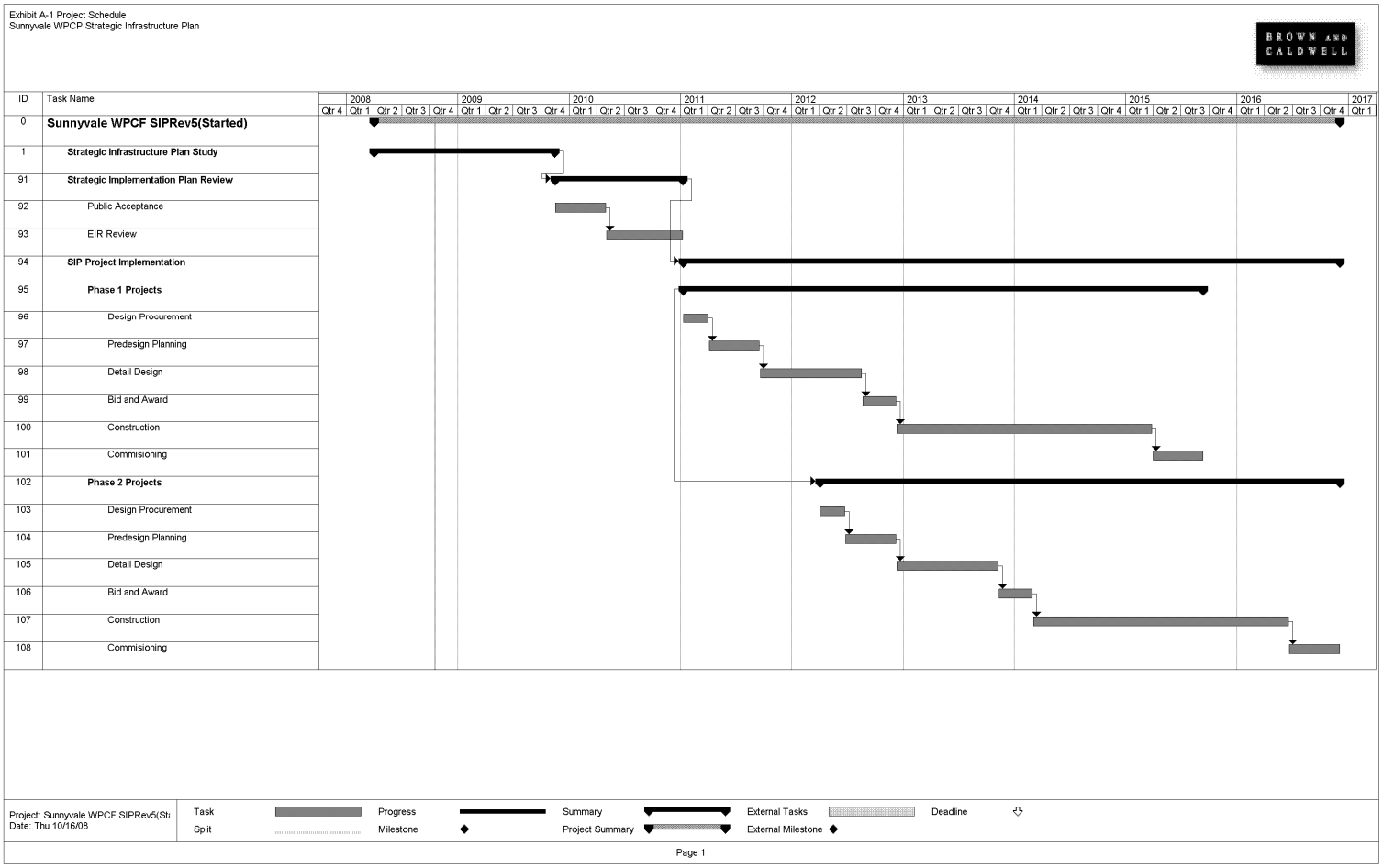
- Condition assessment reports have identified portions of the existing plant that are in extremely poor structural and mechanical condition and are in need of immediate repair or replacement.
- Projects that result through the normal course of completion of the SIP are not likely to be completed and in service until at least another 7 – 10 years from now.
- Certain elements of the plant are recognized as not in compliance with current regulations, deadlines for addressing them may expire before the normal course of the SIP can resolve them. For example, the engine driven influent wastewater pumps are a critical component of the treatment plant and the emissions from the aged engines are known to not be in compliance with air permit regulations for new sources of the same type. New source standards are expected to be applied to these engines as soon as 2012.
- Because the elements identified for early execution would be included in any of the major plant renovation alternatives, there is no downside to proceeding in advance of SIP completion.
- Emergency power capacity at the plant cannot sustain all treatment processes and stable treatment operations are currently at risk in the event of an extended power outage.
- "Band-Aid" solutions to critical issues, to hold out until normal completion of the SIP, are not necessarily the most economical or risk free means to address them.

3. PROJECT DELIVERY SCHEDULE

Figure 3.2 – 1 is a preliminary schedule anticipating the probable sequence of events and time periods associated with ultimate delivery of projects recommended by the SIP. Renewal projects that follow the prescribed course of the SIP are not likely to be finished until at least 2016.

Some process facilities are currently in a severely deteriorated state. Failures or highly frequent unscheduled maintenance events pose significant risks related to the facility being able to perform its designated functions of protecting public health and the environment. Many of the existing facilities have far exceeded their intended design lives and need to be rehabilitated or replaced as soon as possible. This situation exposes the City to higher maintenance costs and increased probability of failures that could impact on customers or the environment (e.g. sewer backups and overflows). If there were to be a failure impacting customers or the environment, the City may be viewed as not having exercised due diligence if it became known that the failed components were known to be outdated and past their useful design lives and the City had the opportunity to act.

Figure 3.2 – 1 Planned General SIP Execution Schedule



3.1 Constraints

It is important to determine that any early execution project be conducted in a way that does not compromise consideration of reasonable alternatives that will be addressed through the SIP. Early implementation projects should only include facilities that:

1. result in the WPCP site still being able to accommodate any of the reasonable SIP alternatives,
2. include a treatment process function that would be reasonably included in any of the reasonable SIP alternatives.

4. FACILITIES SITING CONSIDERATIONS

A concern related to early execution projects is to be sure they are built in a compatible location with other plant processes that will be recommended by the SIP. Considering the broad alternative of replacing the existing plant with new facilities raises the question of the new facilities being located on an alternative site. The primary reasons to consider alternative sites would be:

- If the existing site is not large enough to accommodate required treatment capacity.
- If the existing site is deemed unacceptable for use as a wastewater treatment facility by the community.

The following analysis of plant siting is based on early SIP information gathering and discussions with city staff. Figure 4 -1 indicates the existing WPCP site and its surrounding environment.

- The existing site is the terminus of the wastewater collection system. The existing wastewater collection system is a mostly gravity system and, as such, is energy efficient with respect to the conveyance of sewage to the treatment facilities. Significantly relocating the site would involve a combination of either deep conveyance pipes to a new location and / or the addition of pumping stations to move the wastewater. Adding the need for more pumping energy would be an undesirable outcome that would need to be offset by other benefits of treating wastewater at another location.
- The existing site has positive attributes as a location for wastewater treatment works. It is positioned near the San Francisco Bay which is the only logical receiving water for treated wastewater disposal. The site is surrounded by landfills which provide a buffer between the plant fenceline and neighboring properties as well as an assurance that occupied land uses will not encroach upon the plant fenceline.
- There are very few other potential sites in the immediate surroundings that would be good candidates for location of new treatment facilities. Candidate locations include a parcel adjacent to the Yahoo campus that is west of the westward buffering landfill shown in Figure 4 -1 or the Sunnyvale Baylands County Park to the east of the eastward buffering landfill shown on the figure. The westward site would involve treatment works encroachment adjacent to the high tech campuses of Yahoo and Lockheed Martin, the eastward site would entail conversion of a regional park and developed recreation field into treatment works. Compelling reasons to abandon the existing site would likely be required in order to overcome public resistance to changing the current usage of these adjacent sites.
- The existing site appears to offer some options for accommodating significantly new treatment processes. Figure 4 -2 is a detailed site map of the WPCP, excluding the Oxidation Ponds (which can be seen on Figure 4 – 1). The site offers two major areas of opportunity for siting of new facilities:

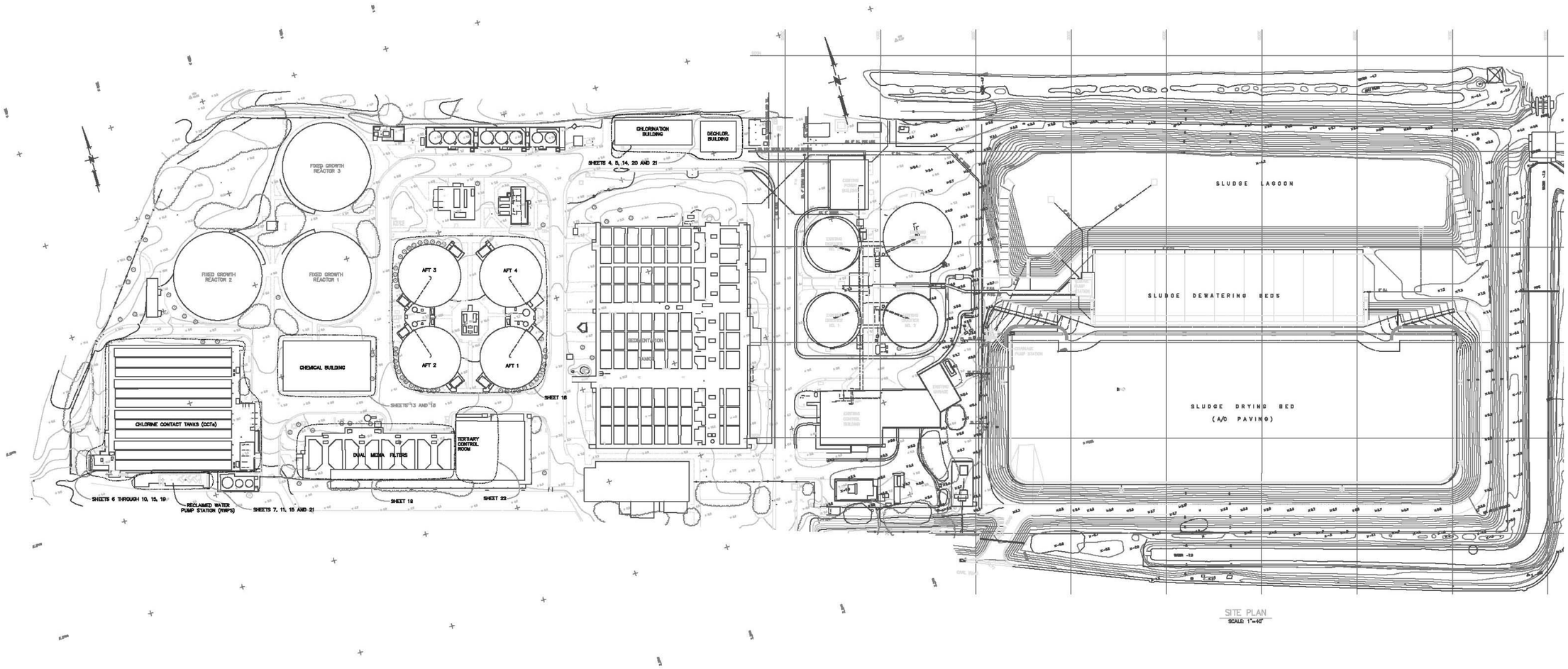
1. Filling in portion of Oxidation Ponds – The broad option of replacing existing processes with new processes will most likely include replacement of the Oxidation Ponds system for secondary treatment with a new secondary treatment process that consumes much less area footprint, such as activated sludge aeration with secondary clarifiers or membranes. The option would likely include converting the existing Oxidation Ponds to some other appropriate community use. To the extent that additional land area adjacent to the existing works may be required, the concept of filling in a portion of the Oxidation Ponds in order to create that space may arise. There will be issues to address in pursuing this option such as impacts on the Bay Trail system, addressing the removal of residuals from the former ponds, wetland habitat concerns, and other community interests related to the south Bay shoreline environment.
2. Conversion of the sludge dewatering and drying areas – Excluding the oxidation ponds, approximately 30 – 40% of the remaining treatment site area is consumed by the current digested sludge processing areas. These are at the east end of the site. This includes a sludge lagoon used for occasional digester maintenance activity, an open outdoor sludge dewatering bed area, and a large area used for storing and further drying of dewatered sludge. These functions can be provided with mechanical sludge processing systems that consume far less site area than currently being allocated, and are also a less labor intensive means of processing dewatered sludge. Moving in this direction could create enough unencumbered site area such that new processes could be added to the site in a staged manner, where other

Figure 4.– 1 Existing WPCP Site and Surrounding Environment (Yahoo Maps)

site areas are ultimately made available by relocation of currently used areas (e.g. primary sedimentation) to the new area.

Because the existing site has many positive attributes as a community location for wastewater treatment and because there appear to be reasonable options available for siting required future facilities at the existing site, it is reasonable to conclude that the SIP process does not need to further consider the possibility of wholly relocating to a new site for treatment. Rather, the SIP alternatives can be located generally on the existing WPCP site.

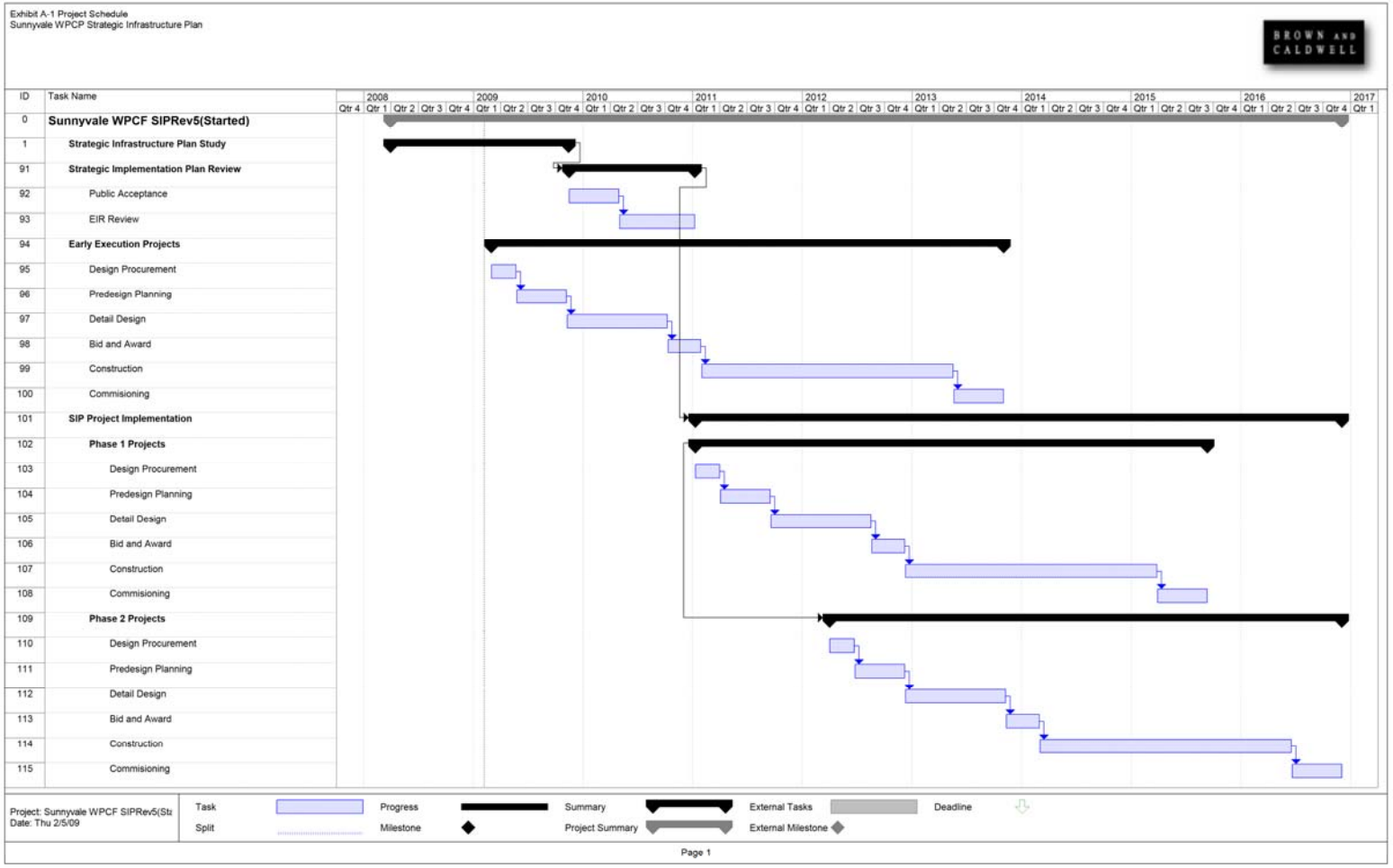
Figure 4 – 2 Sunnyvale WPCP Site Plan (Oxidation Ponds excluded)



5. REVISED SCHEDULE WITH EARLY IMPLEMENTATION PROJECTS

Figure 5-1 is a revised schedule illustrating the impact of an early execution strategy for some projects.

Figure 5-1 SIP Schedule with Early Execution Projects



6. HIGH PRIORITY IMPROVEMENT NEEDS

6.1 Headworks and Primary Sedimentation

6.1.1 Existing Conditions

Headworks facilities include comminution, flow measurement, and raw sewage pumping all contained in the existing Primary Control Building. Primary Sedimentation includes pre-aeration grit removal tanks, primary sedimentation tanks, primary effluent channel, primary sludge and scum pumping gallery and all associated equipment in the tanks and gallery.

In conducting the Strategic Infrastructure Plan, Brown and Caldwell has reviewed prior efforts and studies that have been aimed at defining the needs for replacement and rehabilitation of existing WPCP facilities instead of repeating these prior efforts. While Brown and Caldwell has not been retained to independently evaluate the condition of existing structures, our review of the prior assessment reports and our overview investigations with plant staff lead us to concur that the headworks, primary sedimentation, and grit removal basins should be replaced or rehabilitated at the earliest possible opportunity. Background and evidence for such concurrence is described below.

Headworks facilities are located in the Primary Control Building that houses the influent pumps, comminution grinders and associated works. The Primary Control Building is an original site structure with construction dating back to the 1950s. The Carollo Engineering 2006 Asset Condition Assessment indicated that the structure is not in conformance with current seismic codes. Evaluation of the condition of structures and equipment in the Primary Control Building indicated a moderate level of deterioration including spalling and exposed aggregate in structures and extensive surface corrosion of metal equipment. Much of the equipment in the Primary Control Building is outdated. The report did not identify any critical repair and replacement projects to be conducted in the Primary Control building.

The Auxillary Pump Station has been reported to be in moderately good condition.

Plant staff and recent condition assessment reports have pointed to the primary sedimentation process as being the most vulnerable with respect to on-going maintenance costs, deteriorating equipment and structures, seismic risk, and significant consequences of failure. The primary sedimentation facilities are amongst the oldest at the WPCP with original construction dating back to the 1950s and 1960s.

Carollo Engineers August, 2006 Asset Condition Assessment identified 10 top priority repair and replacement projects totaling an estimated $20.2 million. Six of the ten projects, totaling an estimated $18.1 million, were projects linked to the primary sedimentation process facilities. The report indicated that Primary Grit and Sedimentation Basins 1 – 6 do not meet current California Building Code requirements for seismic protection, whereas Basins 7 – 10 do. The preliminary determination on conformance with codes related to seismic protection was based upon review of structural drawing details, especially with respect to wall thicknesses and concrete reinforcement, that do not comply with current standards. While basins 7 – 10 were granted a slightly higher condition rating than basins 1 -6, all basins were noted to have severe deterioration in concrete and metallic components. Also noted to have severe deterioration were the Primary Effluent Channel and the corrugated metal Primary Effluent Pipeline that transports primary effluent from the Primary Sedimentation Basins to the Oxidation Ponds. The Primary Effluent Channel was granted the lowest possible condition rating. Failure of these structures with a seismic event could cripple even minimal capability to process incoming sewage and that the structures are known to be seismically deficient could be perceived as a lack of due diligence applied to avoiding that contingency.

A 2003 Primary Sedimentation Tank Evaluation by Kennedy / Jenks Consultants delineated numerous structural deficiencies, including:

- Cracked concrete
- Settled slabs-on-grade
- Exposed aggregate
- Exposed and corroding reinforcement steel
- Water leakage into galleries
- Soft and delaminated concrete in gallery walls
- Bubbled and peeled coatings on tank walls
- Corroded grates at concrete openings
- Corroded guardrail
- Corroded access hatches and cracked skylights

Equipment was identified as needing repair, replacement, or additional investigation, including:

- Slide gates
- Raw sludge pumps
- Sludge collector drives
- Cross-over tube penetrations, pre-aeration tank grit pipe flushing lines
- Scum collectors
- Aeration line valves and piping at pre-aeration tanks
- Pre-aeration tank grit hopper mud valve operating stems
- Electric power supply and controls
- Piping

The location of the main primary sedimentation equipment gallery, lying below grade and in between the Pre-Aeration Grit Removal Basins and the Primary Sedimentation Basins, is an additional area of seismic vulnerability.. There are hydraulic crossover tubes (pipes of non-standard materials and shapes) that span the galleries and carry the entire plant flow. These tubes are very vulnerable to failure in a seismic event because they span between independent structures that may laterally displace in an earthquake. Rupture of any of the tubes could endanger personnel life-safety and cause a gallery flood that could damage a great deal of the principal mechanical and electrical equipment associated with the Primary Sedimentation process. It would be prudent to remove this vulnerability point by reconsidering the structural relationship between grit removal, primary sedimentation, and equipment gallery functions.

The primary sedimentation facility should be considered the most important candidate for an early execution project. "Band-aid" solutions involve significant cost, the 2003 Kennedy Jenks report quantified nearly $4,000,000 in repair type costs to address the immediate structural and mechanical deficiencies. These repair recommendations did not address the seismic vulnerability points. Maintenance costs of the aged equipment are significantly higher than would be necessary for renewed equipment because the average time between failures is commonly less for aged equipment, meaning that required occasions to attend and maintain the equipment are more frequent. Higher attention levels and costs for aged equipment distract staff from other important preventive maintenance activities. In summary, primary sedimentation and grit removal basins should be replaced or rehabilitated at the earliest possible opportunity.

6.1.2 Early Execution Project Consideration

While condition assessment reports have indicated only moderate priority to repair and replacement of headworks components, there may be compelling economic efficiencies to integrate renewal of these facilities with a primary sedimentation replacement project. First and foremost is the poor condition, age, and inadequate seismic design of the structure enclosing the facility. Most of the equipment housed in the facility is outdated and in need of major replacement:

- Engine Pump Drivers (likely to be declared out of compliance with emissions requirements in 2012)
- Channel Monsters
- Electrical and Controls
- Environment Controls

Further, influent pumps, while currently in well maintained condition, may ultimately be incompatible with the hydraulic discharge conditions that may result from revision of screening, grit removal, and primary sedimentation facilities.

As with grit removal and primary sedimentation, there is virtual certainty that any of the broad alternatives will include influent pumping and debris removal.

The need for ultimately replacing headworks facilities will tie tightly into siting decisions for replacement of the grit removal and primary sedimentation facilities. Including consideration of the headworks facilities into the predesign planning for the grit removal and primary sedimentation basins can lead to a more integrated coordination of the combination of facilities with the process of developing and evaluating SIP alternatives.

The urgency associated with repair and replacement of the grit removal and primary sedimentation facilities is clear. The remaining question is whether or not conducting an early execution project will compromise the proper execution of the SIP. As stated above, all of the broad alternatives that will be considered for the SIP will include both grit removal and primary sedimentation processes. Grit removal is considered basic hygiene in mechanical wastewater treatment plants as it is necessary to protect mechanical process equipment from excessive abrasive wear and to prevent downstream reactor tanks to effectively lose volume from excessive accumulations of grit materials in zones that are not aggressively mixed.

Primary sedimentation is an economic precursor to all forms of secondary treatment. The removal of readily settleable organic materials with primary sedimentation reduces the overall organic load on the downstream secondary processes that require large volumes and, often, large energy requirements to oxidize the dissolved and non-settleable fractions of organic matter that constitute the majority of wastewater pollutants. Primary sedimentation can, with little energy expense, remove 40% to 60% of total suspended solids that can account for 25% to 40% of the total biochemical oxygen demand (BOD) loading to a plant. Furthermore, the BOD removed by primary sedimentation can be readily thickened and then stabilized with the anaerobic digestion process that is a net producer of energy. Thus, primary sedimentation coupled with anaerobic digestion is one of the most sustainable features of any large WWTP. The existing WPCP includes these elements and the City can be confident that this strategy would still be employed even if it was decided to completely abandon and change all other elements of the downstream secondary and tertiary treatment processes.

The extremely deteriorated condition of the existing tanks and concerns about the schematic structural relationship of the grit tanks, equipment gallery, and sedimentation tanks leave open the question of whether or not the existing tanks and equipment should be aggressively rehabilitated or if completely new structures should be provided. Both courses are possible. New tanks and structures can be built within the current primary sedimentation area because there are currently more tanks available than are required for current wastewater loadings, thus opening the opportunity for staged replacement. Alternatively, new tanks and structures might be built in whole in part of the plant area that is currently used for sludge dewatering and

drying. These choices can be made during a predesign phase for an early execution project. The ultimate siting of replacement grit removal and primary sedimentation basins will have consequences with respect to SIP alternatives and the predesign / design effort should remain tightly coordinated with the process of developing and evaluating SIP alternatives.

6.2 Emergency Power

6.2.1 Existing Conditions

Emergency power is potentially provided at the WPCP through 2 principal systems:

- Digester / natural gas engine drivers for the critical influent sewage pumps that provide the energy required to get incoming wastewater out of the below grade collection pipe, through Grit Removal and Primary sedimentation Tanks and into the Oxidation Ponds. These are, theoretically, indifferent to an interruption of utility supplied electrical power.
- Landfill / digester / natural gas engine driven cogeneration units that generate electrical power and recoverable process heat. These units were originally designed to reduce WPCP electrical costs. The cogeneration units have sometimes been applied for emergency power and are the only emergency power components that provide electrical power to processes during a utility interruption, but the experience of WPCF personnel is that the cogeneration units currently are unable to function as emergency power generators for the WPCF.

The existing emergency power system is a distinct point of vulnerability for WPCP operations. The engine driven drivers for the influent pumps do perform during power interruptions, but there are certain issues with respect to support and control systems that require operator attention during a power interruption. More importantly, these engines must operate continuously and are subject to air emission standards that the current engines cannot meet. These engines will need to be decommissioned soon and it remains an open question whether or not they should be replaced with modern engines or with simpler electric motors.

When originally installed, the cogeneration units could not provide standby power to the WPCP, because the system lacked automation and required excessive manual control adjustments to match engine output to variable plant loads (when not connected to the stabilizing "mass" of the PG and E electrical grid). Tightening emissions standards has required subsequent modifications to the cogeneration units fuel systems. This further diminished the capacity of the cogeneration units to serve as standby generators. Being gaseous-fueled engines tightly tuned for low emissions, the cogeneration units lack the transient power response necessary to respond to changes in WPCF electrical load. Also, it is reported that the energy content of the landfill gas varies by as much as 200 btu per cubic foot. Use of landfill gas with reduced energy content further limits the cogeneration units' ability to respond to transient loads in the power system. . When operating these units "in parallel" or connected to the utility grid, they are able to easily adjust their power output to variations in plant power demands. However, when the electric utility fails or is disconnected, these units try to operate as an "island" off the grid. In this mode, the engine controls are unable to adjust to variations in plant power demands. In "island mode", motor starting for various pieces of plant equipment causes the cogeneration power system to become unstable, resulting in loss of power to treatment processes. This situation is so profound that the system is functionally unreliable for responding to unscheduled interruptions in utility power supply.

In general, the finely tuned engine requirements that are necessary to meet air pollutant emissions limitations for continuously operating sources are incompatible with the rugged and robust engine responsiveness that is required to run a plant in an "island" mode of power generation. Diesel fuelled standby power generators are much more robust in their ability to quickly start and assume power loads in an "island" mode of operation. Because they are intended only for infrequent standby use, they are subject to less restrictive limitations on air pollutant emissions.

In light of the deficiencies described above, we recommend the following:

1. Provide new diesel-fueled engine driven standby generators to meet the critical power demands when there is an interruption in utility power supply.
2. Size the new standby generators to assume the loads from influent pumps as these will be planned to have their current gas engine drivers to be replaced with simpler electric motor drivers.
3. Continue to use the landfill / digester / natural gas engine driven cogeneration units as the principal units for energy recovery from landfill and digester gas. Eliminate their use whenever utility power is interrupted (or use them for marginal power supply in an extended outage after stable operation has been achieved with the diesel powered electric generators).
4. Coordinate the standby power system with improvements of the electrical supply and distribution system.

6.2.2 Early Execution Project Consideration

Provision of electrical power will be a necessary component of any of the broad alternatives that will be evaluated with the SIP. The variable consideration will be how much power to provide. Reasonable estimates of the critical power requirements and their potential variability with SIP alternatives can be made with enough accuracy to properly size a modularized diesel standby power system that will serve any of the ultimately decided SIP outcomes and can address the immediate vulnerabilities that the WPCP is facing with respect to emergency power.

6.3 Electric Power Distribution

6.3.1 Existing Conditions

Many elements of the existing electrical power distribution system are in need of repair and replacement as a result of aging components. Certain electrical distribution components can be considered as directly associated with unit process and others with the backbone of power distribution to all unit processes. During discussions to determine Levels of Service for electric power distribution there was consideration of the adequacy of the plants existing "radial" backbone design that provides very little redundancy to back up failures of electric power distribution system components. An objective of migrating the backbone system to a design following EPA guidelines for a dual-ended system was established. This system, common in many wastewater treatment plants, provides paths of redundancy to continue full or partial operations after any of a variety of system component failures might have occurred.

6.3.2 Early Execution Project Consideration

Early execution projects will, inevitably, include the need to repair and replace significant sub-elements of the electrical power distribution system. These will be opportunities to add components of a revised overall backbone distribution system. Predesign for early execution projects should include development of an electric power distribution master plan that will allow appropriate selection and design of electric power system elements that will ultimately coordinate with the final facilities provided through the normal completion of the SIP.

6.4 Other Early Execution Projects

6.4.1 Dissolved Air Flotation Liquid / Solids Separation

These facilities were identified as high priority for repair in the Carollo Engineers Condition Assessment. The City independently recognized that limited equipment replacements and structure repair needed to be completed even if the SIP ultimately selected an alternative that does not include dissolved air flotation as the liquids / solids separation process, which is an entirely feasible outcome. Accordingly, the City has already commissioned design of limited repair and replacement to essential components of this process.

6.4.2 Sulfur Dioxide Dechlorination Facility

Carollo Engineers August, 2006 Asset Condition Assessment identified the sulfur dioxide evaporators as being near the end of their useful life and identified a relatively high risk factor with failure or unavailability of this component. The City independently determined that reliable dechlorination is essential to the critical process function of wastewater disinfection and that there is a very low cost solution to replace the sulfur dioxide evaporators with a more favorable liquid bisulfite facility. The City is currently executing a $200,000 project to replace the facility. The existence of this project does not provide any barriers to consideration of reasonable SIP alternatives.

6.4.3 Sludge Dewatering

As discussed above, predesign activities of recommended early execution projects may evaluate the prospect of using site area currently dedicated to the sludge dewatering and drying processes. The site area for this function may be greatly reduced through the implementation of mechanical sludge dewatering facilities such as belt filter presses, screw presses, or centrifuges. This process function will be required in any of the major SIP alternatives and the technology selection decisions are generally independent of decisions made for the rest of the treatment processes. Early renewal of this process area may be identified as sensible on the coattails of considerations for how to best address the other high priority early execution projects.

7. SUMMARY RECOMMENDATIONS

- Repair or replace the headworks, primary sedimentation tanks, grit removal tanks, primary effluent channel, and primary effluent pipe.
- For the primary sedimentation tanks, evaluate in predesign the alternatives of replacement in the current location or replacement in the area currently used for sludge dewatering.
- Provide diesel-fueled standby generators for emergency power.
- Develop a master plan for electric power distribution in order for other early execution design projects to add appropriate components of an ultimate electric power distribution backbone system. This plan should be developed simultaneously with planning for new diesel fuelled standby generators.

8. PREDESIGN TASKS

- Geotechnical investigation of existing sludge dewatering area.
- Topographic survey of entire treatment plant site.

- Technical memorandum evaluating the concept of relocating headworks and primary sedimentation facilities to new location in existing sludge dewatering area.
- Raw sewage pumping station predesign evaluation report
- Mechanical screens and screenings processing predesign evaluation report
- Grit removal and grit processing predesign evaluation report
- Primary sedimentation and primary sludge processing predesign evaluation report
- Sludge dewatering system and biosolids disposal predesign evaluation report (if required)
- Standby power system predesign evaluation report
- Electric power distribution master plan report
- SCADA system master plan report
- Project predesign documentation
    - Site plan
    - Process schematic for new facilities
    - Process and instrumentation diagrams
    - Process controls strategy narrative
    - General mechanical arrangements for process areas
    - Discipline design standards and criteria
    - Project drawing list
    - Project specifications list
    - Project execution schedule
    - Estimate of probable construction cost