INVESTMENT GRADE AUDIT REPORT

CAMBRIA COMMUNITY SERVICES DISTRICT

November 8, 2021

Prepared by:

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List of Acronyms

ACRONYM	DESCRIPTION
AACE	American Association of Cost Engineers
AAF	Annual average day flow
ADF	Average day flow
APCD	Air Pollution Control District
BNR	Biological nutrient removal
BOD	Biochemical oxygen demand
CCSD	Cambria Community Services District
CSI	CSI Services, Inc.
DHS	Department of Health Services
DO	Dissolved oxygen
ECM	Energy Conservation Measure
FEQ	Flow equalization
FRP	Fiberglass Reinforced Plastic
gpm	Gallons per minute
HID	High-intensity discharge
hp	Horsepower
HPS	High pressure sodium
HWL	High water level
Hz	Hertz
I&I	Inflow and infiltration
IGA	Investment Grade Audit
kW	Kilowatts
kWh	Kilowatt-Hour
MCC	Motor control center
MGD	Million gallons per day
MLE	Modified Ludzak-Ettinger
MMF	Maximum month average day flow
MTBF	Mean time between failure
NPSH	Net positive suction head
O&M	Operations and Maintenance
OPC	Opinion of probable cost
OSHA	Occupational Safety and Health Administration

ACRONYM	DESCRIPTION
OTE	Oxygen transfer efficiency
PA/PEA	Preliminary (Energy) Assessment
PDF	Peak day flow
PG&E	Pacific Gas & Electric
PRV	Pressure relief valve
psig	Pound-force per square inch
PV	Photovoltaic
RAS	Return activated sludge
RES-BCT	Renewable Energy Self-Generation Bill Credit Transfer
RFP	Request for Proposal
RGPS	Rodeo Ground Pump Station
RS	Raw sewage
SCADA	Supervisory Control and Data Acquisition
scfm	Standard cubic feet per minute
SSO	Sanitary sewer overflow
SST	Sustainable Solutions Turnkey
TDH	Total dynamic head
TMDL	Total Maximum Daily Loading
TOU	Time-of-use electric
VFD	Variable frequency drive
W	Watts
WAS	Waste activated sludge
WTP	Water treatment plant
WWTP	Wastewater treatment plant

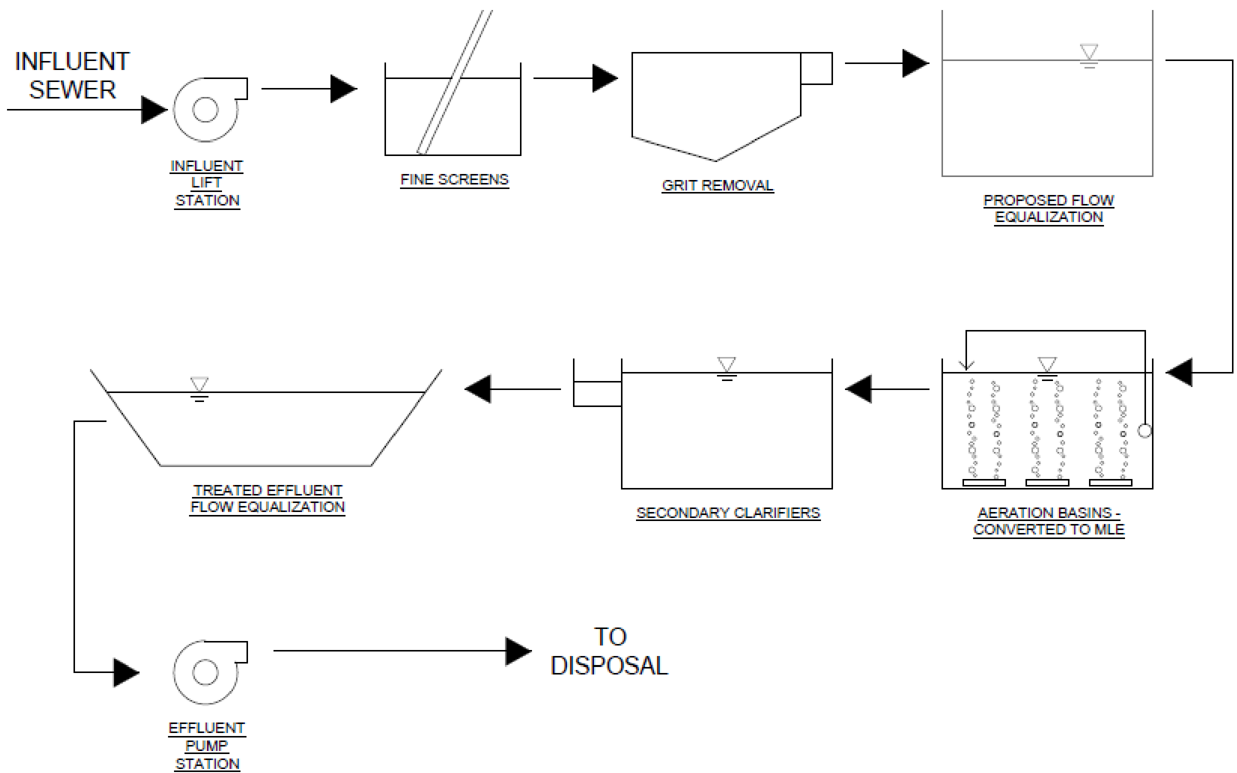


Figure 1: CCSD Wastewater Treatment Plant Process Flow Diagram

1 Executive Summary

In 2018, Cambria Community Services District (CCSD) engaged Pacific Gas & Electric (PG&E) to conduct a Preliminary Energy Assessment (PEA) under PG&E's Sustainable Solutions Turnkey (SST) program. The Final PEA Report was delivered on May 6, 2019. The PEA Report identified 12 infrastructure improvement opportunities that were recommended for further investigation through an Investment Grade Audit (IGA).

PG&E has completed the **Investment Grade Audit (IGA)** services as defined in the contract with the Cambria Community Services District (CCSD), dated January 23, 2020. Generally, the services included additional assessment, engineering and financial analysis intended to define and confirm the initial findings represented in the **Preliminary Energy Assessment.**

The goals of the IGA were to:

- Advance Sewer Fund measure design to sufficient detail to validate technical viability and allow for firm project pricing
- Develop detailed scope, schedule and savings for all Sewer Fund measures
- Conduct contractor procurements as appropriate to obtain market-based competitive pricing of all Sewer Fund measures
- Provide firm-fixed turnkey implementation costs for Sewer Fund measures
- Assist CCSD in securing a financing partner to facilitate Sewer Fund project funding
- Conduct additional preliminary assessment of measures within the Water and General Funds to inform CCSD as to the value of pursuing these measures in the future

Based on the objectives of the IGA, this report provides detail on three (3) distinct pieces of work:

1. **Sewer Fund – Base Project** (page 13)
2. **Sewer Fund – Additional Measures** (page 39)
3. **Preliminary Assessment** of Water and General Fund Improvements (page 45 & 56 respectively)

The proposed scope of work for the **Sewer Fund Base Project** reflects PG&E's and CCSD's assessment of the highest priority measures.

For further reference, the Appendices to this report provide the following:

- 30% or greater design drawings, specifications, SCADA sequences and points list, and scopes of work for all Sewer Fund measures (Base Project and Additional Measures)
- Preliminary concept designs for Water and General Fund measures
- Estimated savings calculations for all measures

2 Approach to Investment Grade Audit (IGA)

Development of the IGA was a highly collaborative and iterative effort involving CCSD facility, financial, and management staff working closely with PG&E and its subcontractor partners. Building on the results of the Preliminary Energy Assessment (PEA), the Investment Grade Audit (IGA) systematically refined the design, scope, schedule, and cost of the Sewer Fund measures with the goal of upgrading CCSD's highest priority needs. Our approach also considered the fiscal boundaries defined by the Fund's anticipated revenues as well as the energy and operational savings from the measures themselves.

The final version of the PEA was submitted on May 6, 2019 and identified the following **Sewer Fund** measures for detailed investigation.

Measure #	Measure Description
1.	Influent Flow Equalization
2.	Influent Lift Station Modifications
3.	Modified Ludzak-Ettinger (MLE) Process Upgrade
4.	Blower System Improvements
5.	RAS and WAS Pumping Improvements
6.	Sludge Thickening
7.	Electrical Upgrades
8.	Backup Power
9.	SCADA System
10.	Secondary Water System (3W) Improvements
11.	Effluent Pump Station Improvements
12.	Sewer Lift Stations

Note that during the course of the IGA, the following **Additional Sewer Fund** measures were identified and added to the investigation.

Measure #	Measure Description
17.	Tertiary Treatment
21.	Storm Drain (eastern fence line adjacent to Santa Rosa Creek Trail)
22.	Demolition of old tanks (southwest corner)

The following **Water Fund** measures were identified for preliminary evaluation:

Measure #	Measure Description
13.	Well sites (SS1, SS2, SS3)

Measure #	Measure Description
14.	Booster stations (Stuart Street Tank, Lemiert Tanks, Rodeo Grounds Pump Station Relocation)
15.	Domestic water tanks (Stuart Street Tanks)

The following **General Fund** measures were identified for preliminary evaluation:

Measure #	Measure Description
16.	Solar PV at the San Simeon well sites
18.	Veteran's Hall lighting
19.	District-owned street lighting

With continual guidance and input from CCSD staff, PG&E and its subcontractors investigated each measure in detail, often extensively modifying early designs to drive down cost or improve function. Once the basic parameters of each measure were defined, PG&E developed designs to the level of detail required to support a procurement process that would result in firm fixed pricing for construction. The measures were prioritized to inform the District in the event financial constraints were encountered during the funding process.

Simultaneously, CCSD and PG&E worked together to refine estimates of future Sewer Fund revenues and energy savings, which collectively estimate the project amount that CCSD could finance. PG&E also conducted a lender procurement process on behalf of CCSD in order to facilitate a financed solution.

After final measure cost determination, it was determined that the following Energy Conservation Measures (ECMs) could be contained within CCSD's financial boundaries. Collectively, these form the **Sewer Fund Base Project**. Reference ***Figure 2*** below for ECM location within the plant.

- Flow Equalization (ECM 1)
- Influent Lift Station Improvements (ECM 2)
- Modified Ludzak – Ettinger (MLE) Upgrade (ECM 3)
- Blower Replacement (ECM 4)
- Return Activated Sludge (RAS) and Waste Activated Sludge (WAS) Improvements (ECM 5)
- Replace Transformer, New Y Series Breaker (ECM 7)
- Emergency Generator Replacement (ECM 8)
- Partial SCADA System Upgrade (ECM 9)
- Secondary Water (3W) Pump Station Improvements (ECM 10)

ECM	Description	Cost	Energy Savings	O&M Savings	Total Operating Cost Reduction
1.0	Flow equalization (incl tank refurbishment)	$1,534,421	$3,429	$1,571	$5,000
2.0	Influent lift station, baffle plate only	$18,261			
3.0	Modified Ludzak - Ettinger upgrade	$1,223,778	$321	$1,571	$1,892
4.0	Blower consolidation / replacement	$258,372	$69,036	$1,571	$70,607
5.0	RAS / WAS improvements	$637,716	-	$1,571	$1,571
7.0	Replace transformer, new Y series breaker	$293,783	-	-	-
8.0	Generator replacement	$423,327	-	-	-
9.0	SCADA	$551,012	-	-	-
10.0	Secondary Water (3W) improvements	$318,202	-	$1,571	$1,571
23.0	Civil scope (trenching)	$313,893	-	-	-
	Final Design	$308,394	-	-	-
	Project Duration / General Conditions Costs	$1,117,904	-	-	-
	Project Development - Sewer Fund	$528,000	-	-	-
	Totals	**$7,527,063**	**$72,786**	**$7,855**	**$80,641**

Notes
Utility savings are the recurring cost reductions due to reduced energy consumption.
Estimated O&M savings are avoided recurring costs to the District which are described in the associated measure descriptions.

A detailed discussion of these measures, including costs and benefits, is provided in **Section 3 – Sewer Fund Base Project**.

Additional Sewer Fund measures were also designed to similar levels of detail, and pricing for these measures was obtained. These are discussed in **Section 6 – Additional Sewer Fund Measures**.

PG&E also conducted preliminary development of several measures for the Water and General Funds. The results of this development effort are discussed in the Appendices as **Section 7 – Water Fund Measures** & **Section 8 – General Fund Measures**, respectively.

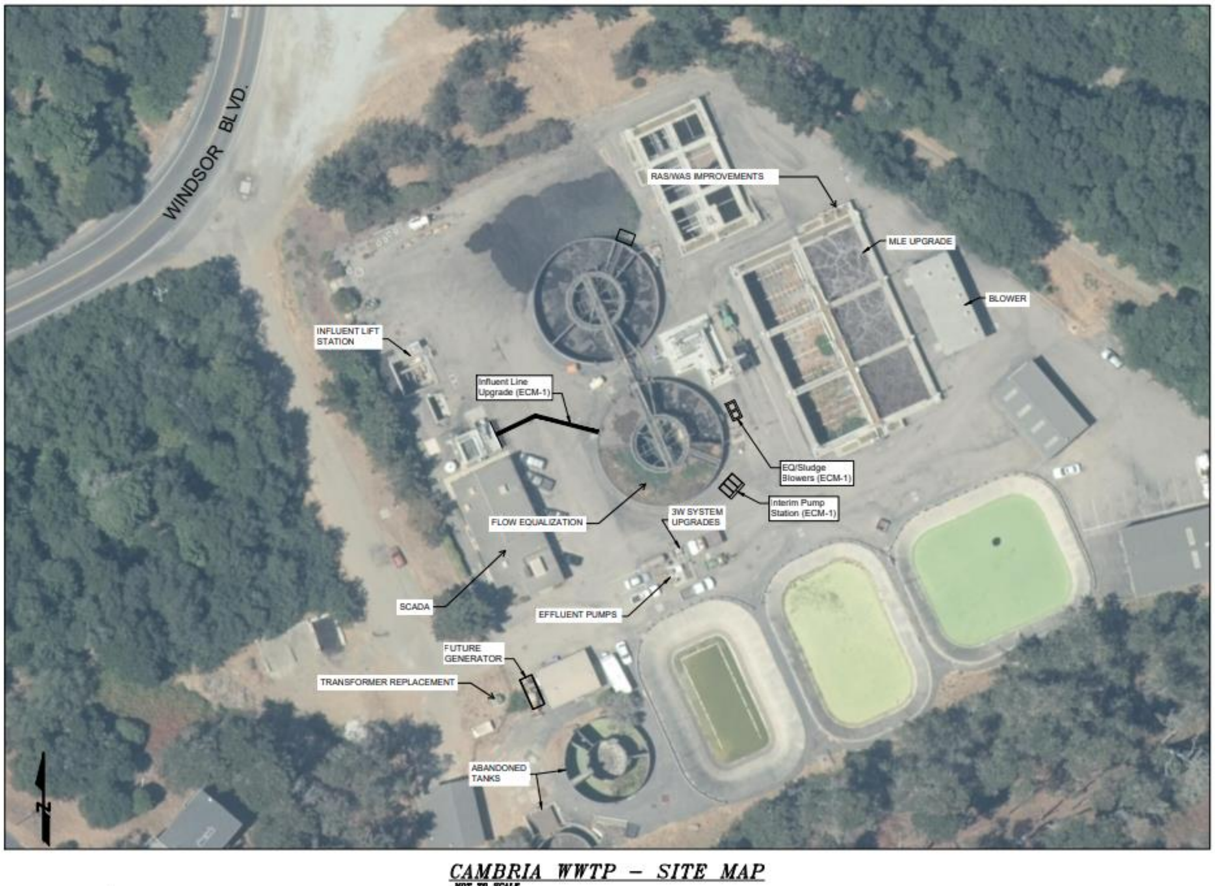


Figure 2: Plant Overview

3 Sewer Fund Base Project – Implementation Proposal

3.1 ECM 1: Influent Flow Equalization

3.1.1 Existing Condition

The plant has a design flow of 1 million gallons per day (MGD). There are two unused partially buried tanks at the southeast corner of the property that were historically utilized for equalization storage. Due to the condition of these tanks, they will remain abandoned. Instead, the two tanks originally designed as clarifiers (located in the approximate center of the plant) will be repurposed for equalization storage and sludge storage. The two tanks are no longer in service as clarifiers but are currently used by staff for sludge management.

Influent currently flows by gravity from the grit removal system directly to the aeration basins. Incoming flows can cause overflow of the grit chamber when two influent pumps operate, and it is suspected that significant debris may be reducing the capacity of the piping between the grit chamber and the activated sludge basins. As of the writing of this report, CCSD has completed installation of a new influent screening system upstream of the grit chamber.

For clarity, note that ECM 1 and ECM 3 (below) are functionally dependent and must be upgraded accordingly to ensure reliable performance of the treatment process. Plant flow cannot be reliably managed without the addition of equalization and/or improvements to the influent pump station. Management of plant flows becomes particularly important when the existing aeration basins are converted to accommodate reliable nitrogen removal through the Modified Ludzak-Ettinger (MLE) process (see ECM 3). To implement the MLE process, the volume in the existing aeration basins will be reduced by approximately 16 percent to accommodate an anoxic zone at the influent end of each of the aeration basins (2). Each aeration basin will have an anoxic zone and aerated zone. The ability of the process to absorb flow variations is reduced in these smaller receiving basins. Therefore, when the plant implements the MLE process, it will become more important to manage consistent flows to maintain process stability, particularly during wet weather flows.

Wastewater Treatment Plant (WWTP) influent flows and loadings from 2018 and 2019 were reviewed. ***Table 1*** summarizes several flow conditions. While Maximum Month Average Day Flow (MMF) for 2019 appears to be at 1.0 million gallons per day, during the majority of the year, average flows are well below this with the average annual day flow (AAF) of 0.544 MGD. The permitted capacity (Waste Discharge Requirements Order No. 01-100) is 1.5 MGD as a 30-day average, based on the discharge capacity.

Historical area precipitation data was reviewed, based on information available through the San Luis Obispo County Public Works Department website, slocountywater.org. It appears that the significant influent flow increases occurred during periods of high and/or prolonged precipitation, indicating the collection system is vulnerable to significant inflow and infiltration (I&I). This is consistent with the observations from District staff. See Section 3.3.1 for additional details. During these wet weather events, although flows are high, influent loading concentrations are low and review of historical effluent quality indicates permit requirements are met at these higher flows. The District is aggressively working to reduce I&I in the collection system, which is expected to reduce wet weather flows at the plant.

	2018	2019	2-year 18/19	2-year 18/19
	gpd	gpd	gpd	MGD
Annual Average Day Flow (AAF)	475,630	612,666	544,148	0.544
Maximum Month Average Day Flow (MMF)	667,903	989,500	989,500	0.990
Peak Day Flow (PDF)	1,685,000	1,418,000	1,685,000	1.685
Minimum Average Day Flow (min ADF)	289,000	378,000	289,000	0.289

Table 1: Cambria CSD WWTP Influent Flows, 2018 and 2019

Although there is currently no permit condition for nitrogen removal, District staff noted the Regional Water Quality Control Board was recommending further limitations on nitrogen loadings at the San Simeon Creek lagoon in a draft March 2015 Total Maximum Daily Loading (TMDL) Report. This earlier draft report proposed a nitrogen target level of 1.3 mg/l (Nitrogen-N) within the lagoon during the dry season to avoid bio-stimulation. According to District staff, Water Board staff have indicated they were pleased with the nitrate removal observed since CCSD began operating the current interim MLE process using temporary piping and pumps. Therefore, it is anticipated that permit requirements could become more stringent in the future.

3.1.2 Proposed Solution

This ECM will include implementation of structural and mechanical modifications to the existing partially buried north and south clarifier tanks, construction of a new 12-inch pipeline from the aerated grit tank to the south clarifier tank, construction of two (2) new dedicated aeration FEQ blowers, and construction of a new FEQ pump station to maintain steady flow to the planned MLE process (ECM 3).

The existing partially buried metal equalization tanks at the southwest corner of the site are not recommended to be utilized for influent flow equalization due to their condition. The associated aeration blower in the blower shed is currently inoperable, and the pump pit between the two tanks is subject to flooding from infiltration during high groundwater events, rendering the tanks inoperable under these conditions.

It is estimated that a total of approximately 120,000 gallons of flow equalization would be required in the existing partially buried steel clarifier tank. Coarse bubble aeration is recommended to reduce odors and maintain suspension of solids during flow equalization. Installation of an equalization blower will provide for aeration needs at the proposed flow equalization tank.

3.1.2.1 Install New 12-inch Gravity line & Valve Bypass on RS Line

Flow from the aerated grit chamber currently travels through an existing 12-inch raw sewage (RS) line towards the now abandoned flow equalization tanks at the southwest corner of the plant site. Repurposing the south clarifier as a FEQ tank will require the construction of a new underground 12-inch gravity line from the aerated grit chamber to the south clarifier FEQ tank (the existing 8-inch gravity line will be abandoned). To isolate the existing line and divert gravity flow to the new 12-inch FEQ line, a new shut-off plug valve will be installed at a new 90-degree bend location just prior to the connection to the old abandoned FEQ tanks. This location is the preferred isolation point to direct RS flows from the aerated grit tank to the south clarifier (new FEQ tank).

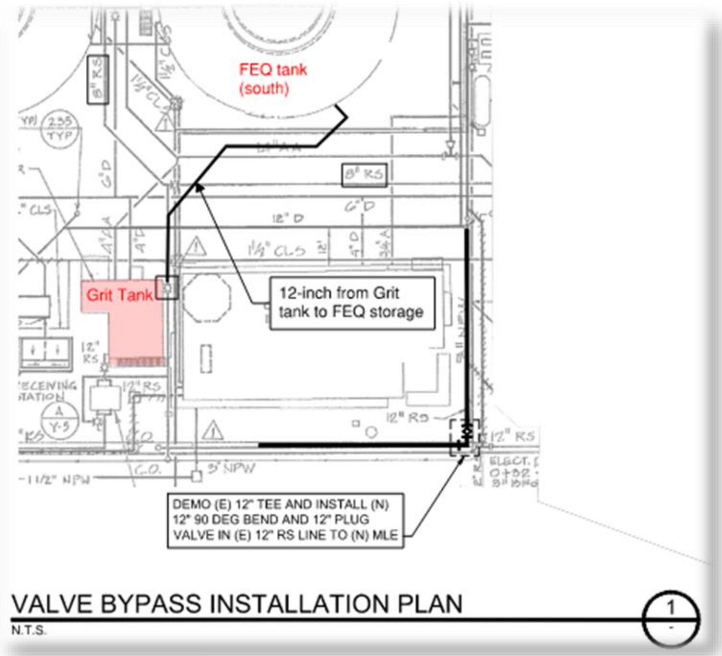


Figure 3: EQ Bypass Valve

3.1.2.2 Rehab Existing Clarifiers

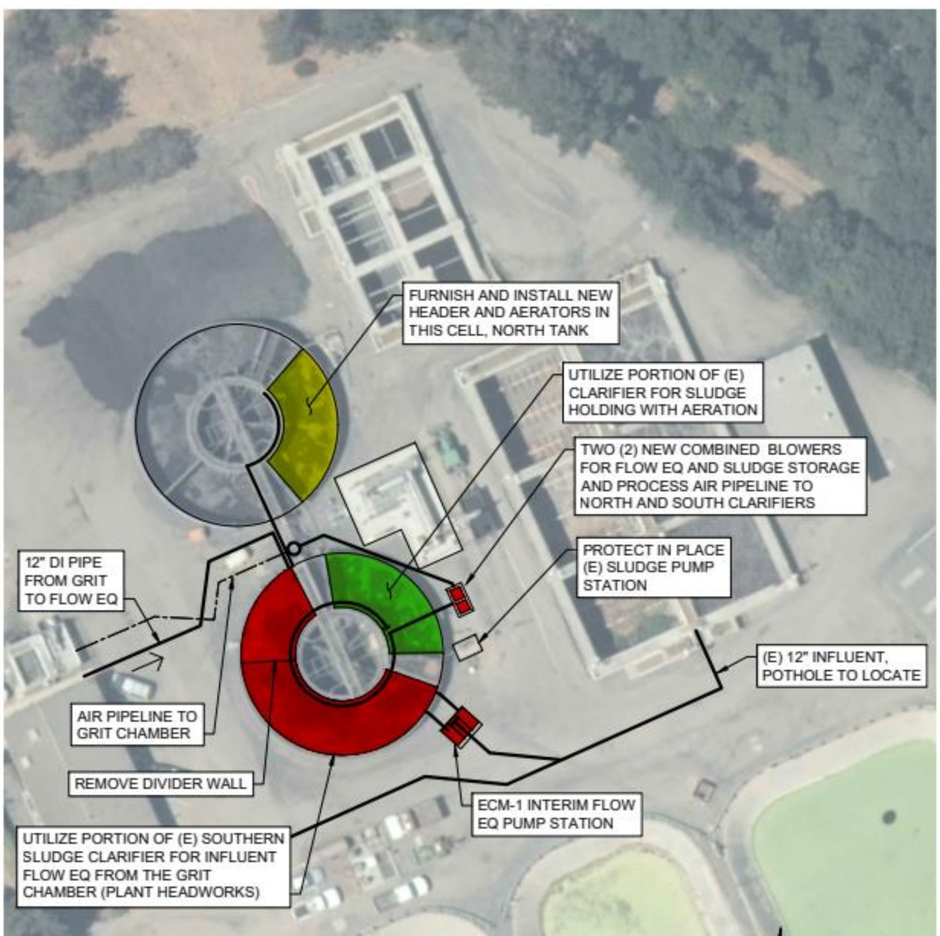
The existing clarifiers are no longer used for secondary treatment as originally designed, and therefore can be repurposed to equalize flows. The equalization basin will be utilized to maintain a steady flow to the MLE process throughout the course of a day. It is not intended to equalize wet weather flows.

Figure 4: Existing South Clarifier (from south)

Figure 5: Existing South Clarifier (from west)

The existing north and south clarifier tanks were constructed in 1979 and are approximately 70-feet in diameter by 16-feet, 6-inches in height with process separation cells for chlorine contact, reaeration, aerobic digestion and decant operations. The tanks are open-top structures with welded steel shells and concrete bottoms. Under agreement with MKN & Associates, Inc., CSI Services, Inc. (CSI) conducted an evaluation on the existing steel holding tanks. Based on the findings of the inspection, it is recommended that the tanks be repaired and recoated for utilization as a flow equalization (south tank) and sludge storage/handling (north and south tanks). This ECM includes repair and recoating of the South Clarifier only. A portion of the North Clarifier will be fitted with new air diffusers, but due to financial constraints recoating of the North Clarifier will be deferred to a later date.

The existing partition in the south tank between the designated chlorine contact zone and reaeration zone will be retained providing approximately 174,000 gallons of storage available within the "Reaeration Zone" portion of the tank, which exceeds the minimum required equalization volume of 120,000 gallons. Additionally, existing walkway grating on clarifier walkways and catwalks will be replaced with Fiberglass Reinforced Plastic (FRP) grating systems. New aeration headers, air drop assemblies and diffusers will also be installed to replace antiquated and corroded air handling appurtenances at the south clarifier tank and on the eastern portion of the re-purposed north clarifier tank.



SITE PLAN
N.T.S.

Figure 6: Clarifiers Rehabilitated for Equalization and Sludge Management

3.1.2.3 Aeration FEQ Blowers

The new equalization storage tank will require process air to the refurbished south clarifier tank and east cell of the north clarifier tank from two (2) variable frequency drive (VFD)-equipped, 40-hp, aeration blowers. Capacity from the new blowers will also provide air to the aerated grit tank through an underground 8-inch process air line. The blowers will be operated in a 1+1 configuration with one duty blower and one standby unit. Coombs-Hopkins quoted an Aerzen Model GM 25S positive displacement blower for this installation. The quoted configuration includes a blower-mounted 40-hp variable frequency drive. The Aerzen Model GM 25S can provide 730 scfm which is large enough for the system needs while allowing for turn-down to a minimum 122 scfm.

3.1.2.4 Flow EQ Pump Station

The equalization basin will require a new pump station to transfer flows from the equalization storage to the aeration basins/MLE process that will be implemented under ECM 3.

FEQ pumps will consist of three (3) 5-hp self-priming centrifugal pumps (2 duty + 1 standby) with VFDs, each with a capacity of 700 gpm @ 16’ TDH. The flow equalization pump station will consist of new pumps, concrete equipment pads, piping, valves, fittings, and pipe supports and will be designed to run continuously.

The construction cost of two new equalization storage tanks and submersible pump station (original proposed scope) is more than the cost associated with re-purposing the existing clarifier tanks for equalization storage and staging. The benefits of storage include backup capabilities for capturing untreated wastewater during emergency situations.

3.1.3 Benefits

- Provides the necessary storage to manage incoming flows and maintain biological nutrient removal (BNR) effectiveness
- Addresses the hydraulic restriction between the grit removal equipment and the aeration basins
- Improves treatment plant efficiency, performance, and reliability
- Reduces the risk of overflow

3.1.4 Potential Savings

This ECM may increase process energy as it introduces an additional pumping stage from the south plant clarifier tank to the existing aeration basins and additional aeration for mixing in the FEQ. While a modest increase in energy use is expected, the overall solution reduces current capital requirements while also providing operational benefits by avoiding potential overloading of mixed liquor suspended solids into the clarifiers from the activated sludge process during high daily flows. Other benefits such as improved operations, existing and future permit compliance, and reduced staff time are anticipated but are difficult to quantify.

3.2 ECM 2: Influent Lift Station Modifications

3.2.1 Existing Conditions

The influent lift station utilizes three 25-hp constant speed suction-lift pumps to lift incoming sewage to the fine screen and aerated grit chamber. The suction inlet of the center pump frequently plugs due to its location directly in front of the wet well inlet opening. When the pump becomes plugged it loses prime and is not operable. When the center pump is out of operation the lift station does not have redundancy.

3.2.2 Proposed Solution

This ECM will include installing a baffle plate at the wet well inlet to direct flow more uniformly into the wet well. The baffle plate will be 16-inches tall and will span across the inlet opening. The baffle plate will be placed 6-inches above the invert of the inlet opening so that low flow is not impeded. During peak flows the incoming influent will be forced to flow both under and over the baffle uniformly so that debris is not concentrated under the center pump suction inlet.

3.2.3 Benefits

- Extends the useful life of the outside pumps
- Reduces maintenance efforts by plant staff
- Provides greater redundancy during peak flows

3.2.4 Potential Savings

Although there are no electrical savings associated with this ECM, the benefits to overall operations, reliability, and maintenance are expected.

3.3 ECM 3: Modified Ludzak-Ettinger Process Upgrade

3.3.1 Existing Condition

WWTP influent flows and loadings from 2018 and 2019 were reviewed. As noted in 3.1.1 and ***Table 1*** above, maximum month average day flow (MMF) from 2018-2019 appear to be 1.0 million gallons per day (MGD). During the majority of the year, average flows are well below design capacity, with the average annual day flow (AAF) of 0.544 MGD. The permitted capacity (Waste Discharge Requirements Order No. 01-100) is 1.5 MGD as a 30-day average, based on the discharge capacity.

Historical area precipitation data was reviewed, based on information available through the San Luis Obispo County Public Works Department website, slocountywater.org. The County's rain gauge is located at Santa Rosa and Main Street in Cambria. Daily precipitation and influent wastewater flows are shown in ***Figure 7***, with precipitation in inches and influent flows in gallons per minute (GPM). The data shows a strong correlation. Significant influent flow increases occurred during periods of high and/or prolonged precipitation, indicating the collection system is vulnerable to significant inflow and infiltration (I&I). This is consistent with the observations from District staff.

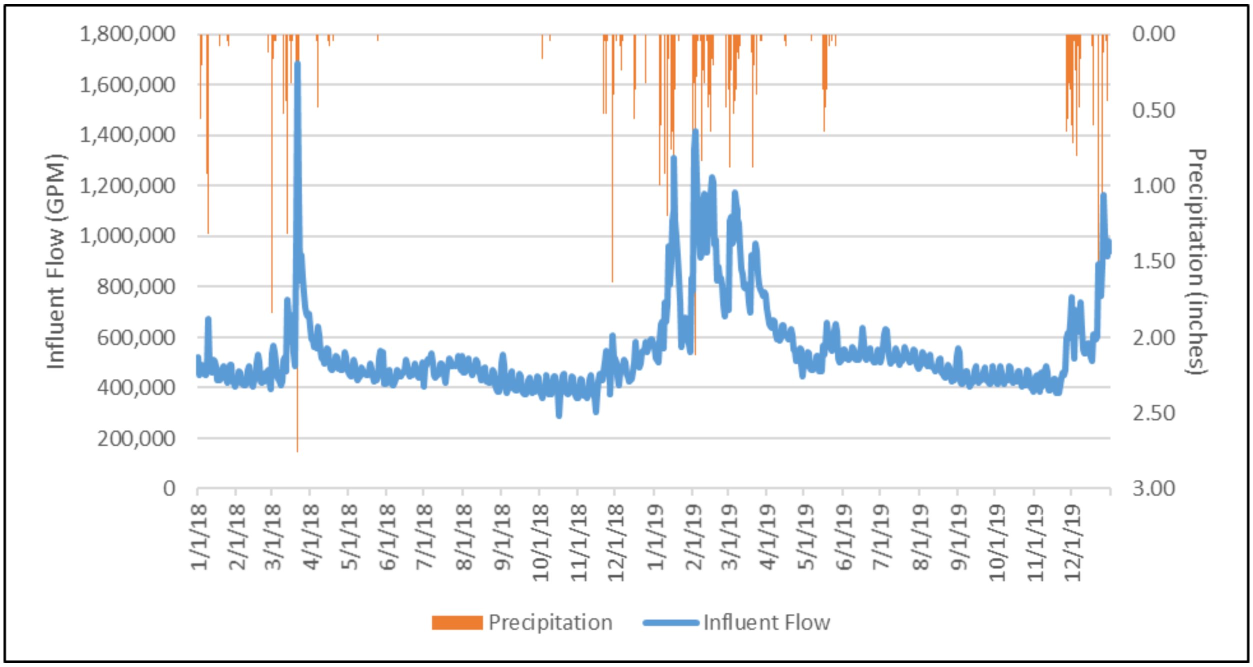


Figure 7: WWTP Influent Flow and Precipitation, 2018 – 2019

In response to the concerns from the draft March 2015 Total Maximum Daily Load (TMDL) Report by RWQCB and underlying groundwater concerns, CCSD completed interim measures to denitrify WWTP effluent. Water Board staff monitor the nitrogen levels on the San Simeon Creek lagoon and have noted a substantial reduction since CCSD completed its interim denitrification efforts. Therefore, although there is currently no permit condition for nitrogen removal, it is anticipated that permit requirements could become more stringent in the future. Interim MLE denitrification efforts have included temporary pumps and piping to recirculate mixed liquor to a zone near the front of the basins where aeration has been turned off to effect anoxic zones. There is no baffling to isolate these zones from the aerated sections of the basins, which limits effectiveness and energy efficiency while increasing the amount of operator time required. Therefore, a more permanent MLE system is needed.

Figure 8: Aeration Basin and Blower Building

According to the 1993 WWTP plant specifications, fine bubble diffusers were specified. The existing diffusers are EPDM tubes (socks), which are periodically changed as they age. Their replacement becomes necessary due to the holes stretching over time and allowing for larger, less energy efficient aeration bubbles to be formed. Based on visual observation and staff input, it is suspected that the diffusers have reached the end of their useful life. It is recommended that the existing diffusers be replaced with fine pore bubble diffusers.

Additionally, the 12-inch header in the basins at the end of the influent piping was removed to reduce hydraulic restriction and accommodate gravity flow from the grit chamber, resulting in uneven flow distribution across the basin.

3.3.2 Proposed Solution

This ECM will include construction of high efficiency air diffusers, construction of basin divider walls or baffles, improvement of recirculation piping, construction of new recirculation pumps, and installation of new submersible anoxic zone mixers. Due to the reduction in volume of the basin resulting from the construction of baffle walls, it is anticipated that influent flow equalization will be necessary to maintain reliable nutrient removal. Accordingly, it is assumed that ECM 1 (Flow Equalization) will be completed in coordination with this ECM. It is assumed that the equalization basin will normalize daily peak and low flows, but will not be sized to equalize wet weather flows. The design flow rate for ECM 3 is 0.99 MGD, based on the 2018 – 2019 maximum month average day flow.

Tables 2 and 3 summarize the anticipated influent water quality, effluent quality goals, and operational parameters. As the design progresses, confirmation of the influent wastewater quality, including the various nitrogen forms, alkalinity, and temperature, is recommended.

Table 2: MLE Process Preliminary Design Flow and Quality Criteria

	Dry Weather Conditions	Wet Weather Conditions	Comments
Max Month Flow Rate (MGD)	0.60	0.99	Based on 2018 – 2019 data
Influent Quality			
BOD_5 (mg/L)	350	220	Based on 2018 – 2019 data
COD (mg/L)	700	400	Assumed
TSS (mg/L)	350	220	Assumed to be the same as BOD, due to inconsistency in historical data
TKN (mg/L)	58	37	Assumed
Ammonium as N (mg/L)	35	25	Assumed
Alkalinity as $CaCO_3$ (mg/L)	400	400	Assumed
Temperature (°F)	58	58	Assumed typical minimum
Effluent Quality Goals			
BOD_5 (mg/L)	<10	< 10	
TSS (mg/L)	< 10	< 10	
Total Nitrogen (mg/L)	< 8	< 8	
Nitrate (mg/L)	ND	ND	
Alkalinity as $CaCO_3$ (mg/L)	70 - 80	70 – 80	

Table 3: MLE Process Preliminary Design Operational Parameter Criteria

Operational Parameter	Criteria
MLSS (mg/L)	3,000 – 4,000
SRT (days)	7 – 20
HRT – aerobic (hr)	4 – 12
HRT – anoxic (hr)	1 – 3
RAS ratio (% of influent)	50 – 100
Mixed Liquor internal recycle ratio (% of influent)	100 - 200

The components and design considerations for the for the MLE process upgrade are described below.

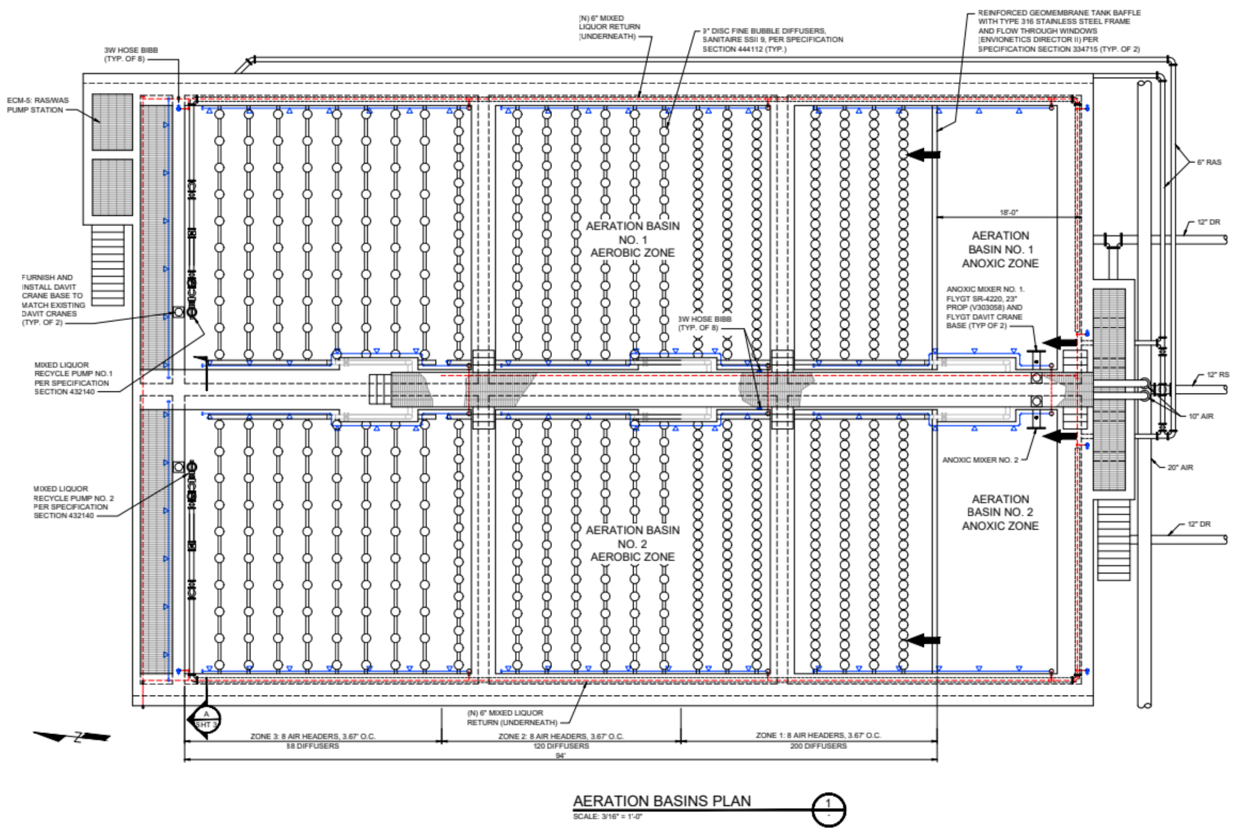


Figure 9: MLE Process Improvements

3.3.2.1 Baffle

The District currently simulates an anoxic zone at the front of the two aeration basins by turning off the air supply to the front of the basins. A physical divide between the aerobic zone and the anoxic zone will reduce oxygen levels in the anoxic zone, allowing for increased denitrification rates and better overall process control. Baffles can be constructed from a variety of materials, including reinforced precast or cast-in-place concrete, reinforced plastics, or stainless-steel framed geomembrane. Baffles can be designed to allow for underflow or overflow or use flow-through windows along the width or at one end to induce serpentine flow.

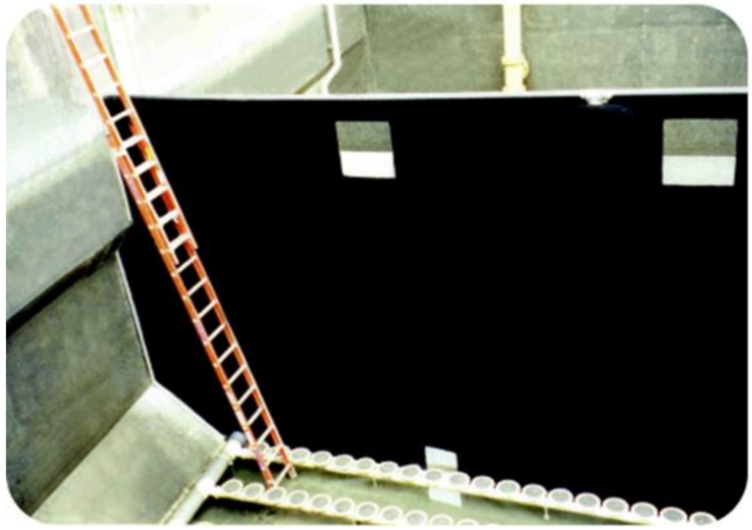


Figure 10: Geomembrane Baffle with Flow-Through Window (Environetics Director II)

At least one baffle wall is recommended. Based on the preliminary design criteria (***Tables 2 and 3***), a baffle at approximately 18-feet from the front wall of each aeration basin is recommended. Further design will evaluate alternatives to reduce the potential for short circuiting through the anoxic zone, effectively reducing hydraulic retention time and denitrification potential. One alternative is to place a second baffle approximately half-way through the anoxic zone. The flow windows in each baffle would be on opposite ends to promote a serpentine flow pattern. Another alternative is a flow distributor, such as the pipe that was previously installed in the aeration basin. At a minimum, larger outlets would be recommended to reduce potential for clogging.

3.3.2.2 Anoxic Zone Mixers

Mixers are used in the anoxic zone to keep solids suspended and maintain complete mixing. Typical power requirements for machinal mixing in the anoxic zone range from 0.3 to 0.5 horsepower per 1000 cubic feet.

There are a few types of mixers that will be reviewed during design, including conventional mechanical propeller mixers and air-powered mixers. Flygt makes a propeller mixer with a sealed, submerged variable frequency drive, allowing for speed adjustment to more readily match process demands, which could change by temperature and other factors.

Figure 11: Submersible Propeller Mixer (Flygt 4320)

Air-powered mixers consist of coarse bubble diffusers beneath a steel tube which direct the air flow to provide air-lift mixing. These types of mixers have the advantage of no moving parts, which eliminates ragging potential. The required air can be supplied by either a small air compressor that sits on the deck near the mixer or through a small air line drop off the main air supply for the aeration basin.

3.3.2.3 Fine-Bubble Porous Diffusers

The existing diffusers will be replaced with porous fine-bubble diffusers, likely in a grid pattern, utilizing either disc or tube diffusers. The diffuser system will coordinate with the existing air piping and connect to the existing 6-inch air piping, reusing the isolation valves and stainless-steel drop legs, if possible. A minimum dissolved oxygen concentration of 2.0 mg/L is recommended in the aeration basin. It is assumed that two dissolved oxygen (DO) probes will be installed in each aeration basin, one near the inlet and one near the outlet. The DO probes will be used to monitor and may be used to control air flow rates in the basins, either through minimum or average set points.

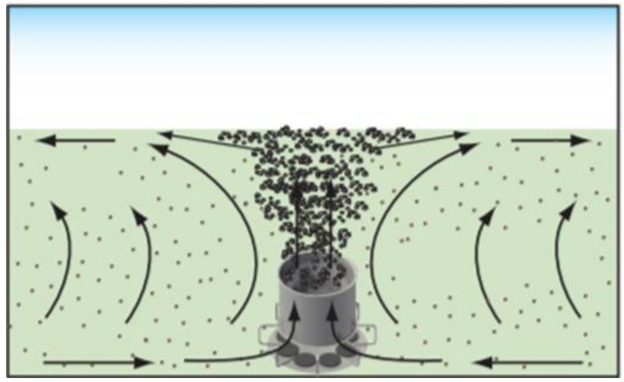


Figure 12: Air-powered mixer (Medora Corp)

3.3.2.4 Internal Mixed Liquor Recycle

It is assumed that the existing submersible mixed liquor recycle pumps will need to be replaced. Solids-handling submersible pumps, sized to handle up to 2 MGD each, will be installed, one at the end of each aeration basin. Preliminary design for the discharge piping consists of 8-inch ductile iron piping from the pump to the front of the two anoxic zones. The discharge piping will include check valves, magnetic flow meters, and isolation valves, arranged so the flow meters and valves are accessible from the deck.

3.3.3 Benefits

- Reduces energy usage by installing high efficiency diffusers for improved oxygen transfer
- Reduces volume requiring aeration by partitioning the anoxic and aerobic zones
- Provides reliable nutrient removal
- Replaces mechanical equipment which has failed and/or reached the end of its useful life
- Provides improved flow distribution
- Reduces burden on staff

3.3.4 Potential Savings

The savings calculated for this ECM includes the savings associated with the improved oxygen transfer efficiency (OTE) of new fine pore bubble diffusers to replace nonfunctioning diffusers, reduced aeration and mixing requirement through isolating the anoxic zone, and improved flow distribution. It is assumed that ECM 4 (Blower Improvements) and ECM 1 (Flow Equalization) have already been completed.

Isolating the anoxic zone reduces the volume in the basin requiring mixing by aeration. Installing new diffusers will also improve overall efficiency since some of the existing diffusers have obviously failed and require replacement. It is estimated that this ECM would reduce energy consumption by approximately 8,200 kWh/year, or $338 annually.

3.4 ECM 4: Blower System Improvements

3.4.1 Existing Condition

The WWTP has two activated sludge aeration basins that use coarse bubble diffusers to provide oxygen for microbial digestion of wastewater. The basins are supplied with compressed air by two multistage, centrifugal blowers driven by 125-hp motors and one multistage, centrifugal blower driven by a 100-hp motor that previously served the equalization ponds. The three blowers are located in a nearby blower building. Normally, only one of the 125-hp blowers operates to produce compressed air for the aeration basins and the aerobic digester.

Figure 13: Existing Multi-stage blowers

Currently, one blower is equipped with a VFD, and the second unit has a soft starter. The VFD installed on the 125-hp blower has limited turn down (air flow output reduction).

A plant wide air system conveys process air to the activated sludge basins and sludge holding tanks from three constant speed, 125-hp, multi-stage Hoffman centrifugal blowers[1]. Multi-stage blowers incorporate several impellers that are housed within a staged volute assembly directly connected to a motor. The capacities of the multi-stage Hoffman blowers are not currently controlled. They are manually operated by plant staff and are not controlled by dissolved oxygen (DO) or other parameters in the activated sludge basins. DO control is not used because the existing centrifugal blowers are prone to surging if the air output rates are reduced too much. Additionally, although the plant Supervisory Control and Data Acquisition (SCADA) monitors DO levels, the existing DO sensor telemetry is no longer functional. ***Figure 14*** shows a partially closed valve in the blower air distribution piping.

[1] A fourth blower rated at 100-hp is in place and was used for mixing the influent EQ basing (no longer in use). This blower does not have adequate capacity for other uses and is not utilized for any processes.

Figure 14: Partially Closed Blower Air Distribution Valve

The existing Hoffman blowers (Hoffman model No. 38407A1) were installed as part of the 1993 upgrades. Improved technology is now available which is both more energy efficient and more readily operated under variable speeds. The Hoffman blowers have a rated capacity of 2,000 scfm at a rated discharge pressure of 25 psig. The blowers are currently operated at 100 percent of capacity and are equipped with inlet throttling valves, but these valves are not modulated to regulate blower flows. Multi-stage blowers are generally less efficient and have less turndown capability than other available options. The existing blowers are also at the end of their useful life. Finally, holes in the existing blower ducts release warm air into the motor control center (MCC), reducing air delivery to the basins while also increasing cooling requirements into the MCC room.

Table 4: Existing Aeration Blowers

Blower	Manufacturer and Model No.	Blower Type	Qty	Control	Blower Motor (hp)	Status
Main Blowers	Hoffman 38407A1	Centrifugal	1 (active) 2 (standby)	1-VFD 1-Soft Start 1-None	125	1 On
Pony Blower	Hoffman 4208A	Centrifugal	1	None	100	Off

3.4.2 Proposed Solution

This ECM will include construction of a new blower, aeration piping modifications, duct repair, variable frequency drive, and dissolved oxygen control systems to improve efficiency and effectiveness. The DO control panel will monitor dissolved oxygen levels and airflows within the aeration basins and control the positions of the airflow control valves at each aeration basin to maintain DO setpoints. DO control will allow the blowers to run only at the required rate, reducing electrical usage and avoiding over-aeration. New DO sensors will be installed in each basin and connected to the plant's SCADA system.

MKN evaluated the use of hybrid and turbo blowers to replace the existing multi-stage centrifugal blowers. Turbo blowers tend to be more energy efficient than hybrid blowers but have lower turn down (2: 1 for turbo blowers versus 4:1 for hybrid blowers). Ultimately, the treatment plant needs a higher turn down to eliminate the need for throttling air flow. Hybrid blowers equipped with VFDs were selected to provide better efficiencies over the range of blower turndown than can be achieved through inlet throttling.

Coombs-Hopkins quoted an Aerzen Model D 29S hybrid blower for this installation. The quoted configuration includes a blower-mounted 40-hp variable frequency drive. The Aerzen Model D 29S can provide 881 scfm which is large enough for the system needs while allowing for a turn-down to a minimum 322 scfm. Although the original concept was to replace all three blowers, the scope has changed to replace only one blower and maintain the additional existing blowers in a standby capacity.

It is recommended to install new, variable speed, higher efficiency blowers and enable DO control to vary aeration rates based on measured DO in the basins. The WWTP's SCADA system should be upgraded to control the new blowers' output based on measured DO in the basins. Energy savings will result from the use of a higher efficiency blower, reduced blower discharge pressure, and reduced blower air output (reduced DO setpoint) for aeration.

3.4.3 Benefits

- Reduces energy usage by installing high efficiency blowers, variable speed drives, mass air flow meters, and automated controls
- Reduces over-aerating by introducing DO control to ensure stable and efficient control of the plant's process air system
- Eliminates the need to throttle flow with valves
- Reduces air conditioning loads by eliminating hot air entry into conditioned space
- Replaces mechanical equipment which has failed and/or reached the end of its useful life
- Reduces burden on plant staff

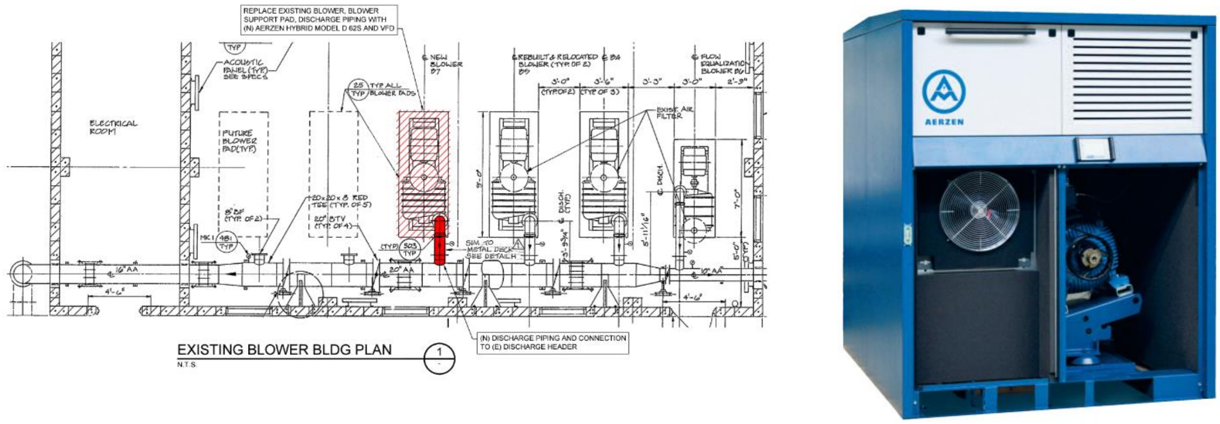


Figure 15: Blower Layout and Aerzen Hybrid Blower (typical)

3.4.4 Potential Savings

The savings associated with this ECM assumes that ECM 3 has already been completed. Blower power requirements were calculated assuming an OTE of 20%. The majority of savings associated with this ECM are anticipated as a result of improved blower efficiency, providing the ability to reduce aeration during low demand periods, and reducing over-aerating by utilizing DO control. Under 2017-2018 operating conditions, blower power consumption for both aeration and mixing demand was estimated to be approximately 87 kW. Power requirement after this ECM is implemented is estimated at 32 kW and is based on the minimum air flow required for mixing, which exceeds the air flow required to meet biochemical oxygen demand (BOD)[2].

The savings associated with this ECM are anticipated to be approximately 381 MWhr/year, slightly over $69,000 annually.

3.5 ECM 5: RAS and WAS Pumping Improvements

3.5.1 Existing Condition

After aeration and settling, return activated sludge (RAS) pumps return a portion of the settled solids into the aeration basin to enhance aerobic digestion, and waste activated sludge (WAS) pumps transport the remaining solids to the aerobic sludge digesters for further degradation. The RAS and WAS pumps are controlled by timers. One of the RAS pumps utilizes a VFD as a soft starter (24.2 Hz), while the other operates with a VFD at fixed speed (22.8 Hz). The two RAS pumps each run continuously at 200 gpm at

[2] The air volume required to meet BOD is estimated at 360 cfm, the air volume required for mixing is 1,000 cfm. This mixing requirement only includes the aerated portion of two MLE reactors, not the anoxic zones. Additional aeration demands for mixing for other uses (influent equalization, sludge stabilization, etc.) are included in other ECMs.

20 Hz. They are oversized for current flows and are operated as low as 20 Hz via VFD. This results in inefficient operation. Two separate WAS pumps are installed, and it would be preferable for WAS flows to be delivered through valve(s) on the RAS piping, thereby eliminating two pumps. Skimming troughs and scum pumps are not functioning.

Figure 16: RAS/WAS Piping

Figure 17: Tipping Trough

3.5.2 Proposed Solution

The existing RAS and WAS pumps were initially installed as part of the 1993 improvements, along with the ability to independently control both systems. However, that feature was never utilized, and the system may no longer have this capability. Scum troughs and scum pumps have failed. This ECM will include construction of new RAS pumping systems with variable frequency drives (VFDs), scum tipping troughs and motors, and actuator assemblies. Existing 5-hp WAS pumps, rails, discharge piping, piping supports, and valves will be removed, and motorized control valves will be installed to automate RAS/WAS control schemes and operation. A single RAS/WAS control system will be instituted utilizing the new motorized control valves to allow for independent control of the system.

3.5.3 Benefits

- Reduces the amount of equipment to operate and maintain
- Reduces energy usage by installing high efficiency pumps with more refined flow ranges
- Replaces mechanical equipment which has failed and/or reached the end of its useful life
- Reduces burden on staff

3.6 ECM 10: Secondary Water System (3W) Improvements

3.6.1 Existing Condition

The existing secondary or plant water (3W) pumps have reached the end of their useful life. The existing system pumps run at a constant speed. A pressure relief valve (PRV) maintains a set pressure in the plant system and discharges water back to the influent wet well where it is re-pumped by the system.

Figure 18: Secondary Water Pump Station

3.6.2 Proposed Solution

The existing 3W system consists of two 15-hp constant speed pumps. The existing system was based on a design that simplified operation but was not energy efficient. For example, when the system over-pressurizes non potable water it returns it to the wet well through a pressure relief valve, only to be pumped again. The secondary water system runs continuously. A more efficient system would utilize submersible pumps, VFDs and/or a hydropneumatic tank to optimize pump performance. This ECM will include installation of two (2) new submersible 25-hp 3W pumps with VFDs, lifting chains, rails, valves, and piping. Additionally, new instrumentation and controls will be implemented to better manage system pressures and reduce operating costs. A new hydropneumatic tank will also be installed to help manage system pressures and optimize pump performance.

MKN is working with District staff to evaluate pre-engineered skid-mounted systems as a potential alternative solution.

3.6.3 Benefits

- Reduces energy usage by eliminating release of pressurized water back to the wet well
- Reduces energy usage by coordinating pump operating point with plant demand
- Replaces mechanical equipment which has reached the end of its useful life
- Reduces burden on staff

3.7 ECM 7: Replace Transformer, New Y Series Breaker

3.7.1 Existing Condition

The District has experienced disruptions in the quality of electrical service, resulting in failure of critical plant electrical infrastructure. The existing PG&E service transformer is a live-front unit that provides a 480V, three-phase, three-wire ungrounded service to the CCSD service switchboard, which is also rated 480V, three-phase, three-wire. The service switchboard includes an automatic transfer switch for connection of an existing 365kW on-site standby generator.

3.7.2 Proposed Solution

PG&E plans to replace the existing live-front transformers with dead-front transformers due to safety considerations. PG&E service upgrade is subject to final confirmation through the New Service application process. Upon approval of new service, a new 1200A, 480Y/277V, three-phase, four-wire service switchboard will be installed. The current electrical code requires the service overcurrent protection to include ground-fault protection.

A new service switchboard will be constructed between the new PG&E dead-front transformer and the existing CCSD service switchboard. This will allow the existing switchboard with its overcurrent devices to remain unchanged. The new service switchboard will include an integral automatic transfer switch that will be connected to the standby generator.

3.7.3 Benefits

- Provides code- and PG&E-compliant solution for upgrade to grounded PG&E transformer (PG&E pays for transformer)
- Improved voltage stability compared to current ungrounded system
- Avoids need for plant-wide rewiring

3.7.4 Potential Savings

There are no energy savings for this ECM; however, renewing the system would result in some annual maintenance and repair and replacement savings.

3.8 ECM 8: Emergency Generator Replacement

3.8.1 Existing Condition

The existing 365 kW diesel backup generator was installed in 1976 and has reached the end of its useful life. The San Luis Obispo County Air Pollution Control District (APCD) limits use of the generator to emergency conditions and a small number of hours annually for maintenance. Currently, District staff can only view generator status via the SCADA system. It is preferred to have remote control of the generator via SCADA.

3.8.2 Proposed Solution

This ECM will include installation of a new 500 kW diesel fueled generator. The new generator will be installed next to the Break Room Building and will be connected to the new electrical switchgear which is included in ECM 7. The old 365 kW generator and its appurtenances will be removed. The new generator will be equipped with a weatherproof and sound attenuated enclosure, integral 850-gallon fuel tank, control system with SCADA interface, and diesel particulate filter. With an 850-gallon tank, a 24-hour run time would be expected with 100% load, 30 hour run time would be expected at 75% load, and 36 hour run time would be expected at 50% load. In reality we would expect the run time with a full tank to be much longer, as the electrical load will be variable and would rarely be expected to operate higher than 50% the rating of the generator.

3.8.3 Benefits

- Integrates new emergency generator into SCADA
- Improves treatment plant reliability during power outages
- Reduces burden on staff to maintain the existing generator
- Replaces critical infrastructure before it fails
- Reduces regulatory restrictions on operations
- Reduces ongoing permitting costs and activities

3.8.4 Potential ECM Savings

There are no energy savings for this ECM; however, renewing the system would result in some annual maintenance and repair and replacement savings.

3.9 ECM 9: SCADA System

3.9.1 Existing Condition

The WWTP has a limited Supervisory Control and Data Acquisition (SCADA) system that provides monitoring and some manual operator control. The SCADA system has very little automatic functionality requiring a significant amount of active monitoring and manual intervention by plant staff. The system is no longer supported by the manufacturer and system hardware is beyond its useful life.

The SCADA system hardware consists of an OPTO-22 based platform. The operator workstation is located in the Maintenance Building. The existing system utilizes an auto-dialer to alert staff in the event of a plant alarm. The auto-dialer is configured to send an alarm which is broken into 12 categories. Armed only with the “category” of the alarm, the WWTP staff must investigate the causes of the alarm once they reach the WWTP.

3.9.2 Proposed Solution

This ECM will include a new plant SCADA system for remote control, monitoring, and automation of processes. The project will replace Modicon hardware that is no longer supported and beyond its useful life as well as reduce both maintenance and downtime. The new system will simplify the controls architecture by consolidating SCADA hardware to Opto-22, and by removing old hardware that has been decommissioned and abandoned in place. Additionally, migration to the new hardware will better prepare the plant for integration of any new equipment in the future.

The Water Treatment Plant (WTP) already has a server located at the WWTP and license to the Ignition SCADA software. It has been determined that the WWTP can share this license and server in order to avoid the cost of purchasing their own.

The new SCADA system will control both existing equipment in the plant, as well as new equipment that is to be installed within the scope of this project. The SCADA system will monitor and automatically control the speed of the new blowers and pumps, which contributes to the energy savings of the project. After installation of the new SCADA system a training will be provided to plant staff.

3.9.3 Benefits

The increased functionality of the SCADA will significantly improve operational efficiency and facilitate simplified control and troubleshooting.

3.9.4 Potential Savings

There are no energy savings attributed directly to this ECM, although automated control facilitates the savings generated by other elements of the project.

3.10 Base Project Procurement, Costs and Schedule

3.10.1 Procurements and Contractor Selection

PG&E administered a thorough procurement process to obtain firm pricing for the Sewer Fund measures. Separate RFPs were issued for electrical scope (transformer replacement and Y series breaker installation, generator replacement) and mechanical/SCADA scopes (all other Sewer Fund measures). RFP documents included 30% or better design drawings, detailed specifications, sequences and points lists. RFPs were approved by CCSD staff prior to being issued to invited subcontractors.

After evaluating proposals, PG&E has selected Fluid Resource Management (FRM) and Alpha Electric as the subcontractors responsible for installation of the Base Project scope (Mechanical and Electrical respectively). These subcontractors will work directly under PG&E's primary development and general contractor, Southland Energy.

3.10.2 Procurement Process and Results

PG&E competitively bid the mechanical, electrical and SCADA scopes of the project. The bid documents included detailed design drawings, specifications and scope narratives. The complete sets of bid documents have been provided to CCSD staff.

3.10.2.1 Mechanical Scope

In our RFP, we requested pricing for the Base Bid set of measures (Modified Ludzak-Ettinger upgrade, blower consolidation, RAS/WAS improvements, Secondary Water (3W) improvements, and demolition of existing equalization tanks. We requested an Add Alternate price for Flow Equalization, with the following results:

Invited Bidder	Base Bid	Add Alternates
Fluid Resource Management	$2,879,929	$1,550,430
Cushman	$2,819,070	$1,992,870
WM Lyles	$4,082,130	$2,679,885
Brough	$2,898,180	$1,586,250

As the totals exceeded the budgeted amount, our design team worked extensively with the contractors and CCSD staff to streamline the design and reduce its cost. We also substantially modified the Flow Equalization ECM and included it in scope. Tank demolition was removed from the scope to reduce total project cost. This was done to provide an effective and reliable operational solution with an overall project cost that could be funded from the existing Sewer Fund operating budget.

In addition, we moved civil scope (concrete pads and trenching) required for the electrical contractor's scope to the mechanical contractor's scope. Since the mechanical contractor would be carrying out significant amounts of trenching and buried pipework, consolidating all civil under the mechanical contractor reduced overall project cost.

Modifying and confirming the new designs required several months. Due to highly volatile market conditions relating to supply chain shortages, equipment and subcontractor labor pricing, as well as substantial scope modifications, an updated price for the revised scope was required. This was obtained using a Best and Final Offer (BAFO) process. To ensure continuing competitiveness, we requested BAFOs from the two lowest Base Bid contractors.

Final mechanical scope and cost resulting from this process is shown below:

ECM #	Item	Cost
1.0	Flow equalization (incl tank refurbishment)	$1,534,421
2.0	Influent lift station, baffle plate only	$18,261
3.0	Modified Ludzak - Ettinger upgrade	$1,223,778
4.0	Blower consolidation / replacement	$258,372
5.0	RAS / WAS improvements	$637,716
10.0	Secondary Water (3W) improvements	$318,202
23.0	Civil work (for mech and elec scopes)	$313,893
	Total Mechanical Scope	**$4,304,643**

3.10.2.2 Electrical Scope

Our Electrical RFP requested pricing from four subcontractors to supply and install equipment associated with the new transformer and backup emergency generator. Results were as follows:

Invited Bidder	Cost
Alpha	$651,324
Smith	$1,024,088
Thoma	Declined
Electrocraft	Declined

Subsequent to contractor selection (Alpha), the scope was modified to include a shed and drainage system, arc flash studies and reconnection of existing backup generators. Final electrical scope and cost resulting from this process is shown below:

ECM #	Item	Cost
7.0	Replace transformer; new Y series breaker	$293,783
8.0	Generator replacement	$423,327
	Total electrical scope	**$717,110**

3.10.2.3 SCADA Scope

SCADA scope was the subject of nearly continuous modification to accommodate the evolution of the associated project work. Since the SCADA scope is directly tied to the mechanical and electrical scopes, every change in design or approach impacts the SCADA scope and cost. The intent of the original SCADA scope was to entirely replace the existing system and expand it to include all points requested by CCSD WWTP staff. Our SCADA RFP was drafted using this approach and issued to three potential bidders.

We received only one response from Tough Automation, which is the incumbent provider of SCADA solutions on the site. The bid amount for the RFP scope exceeded $1.4 million. This amount exceeded the budget constraints of the project. Consequently, we have worked closely with plant staff and Tough to reduce the hardware and programming to the minimum amount necessary to achieve a functional system while still meeting budget constraints.

Current SCADA cost is $551,012.

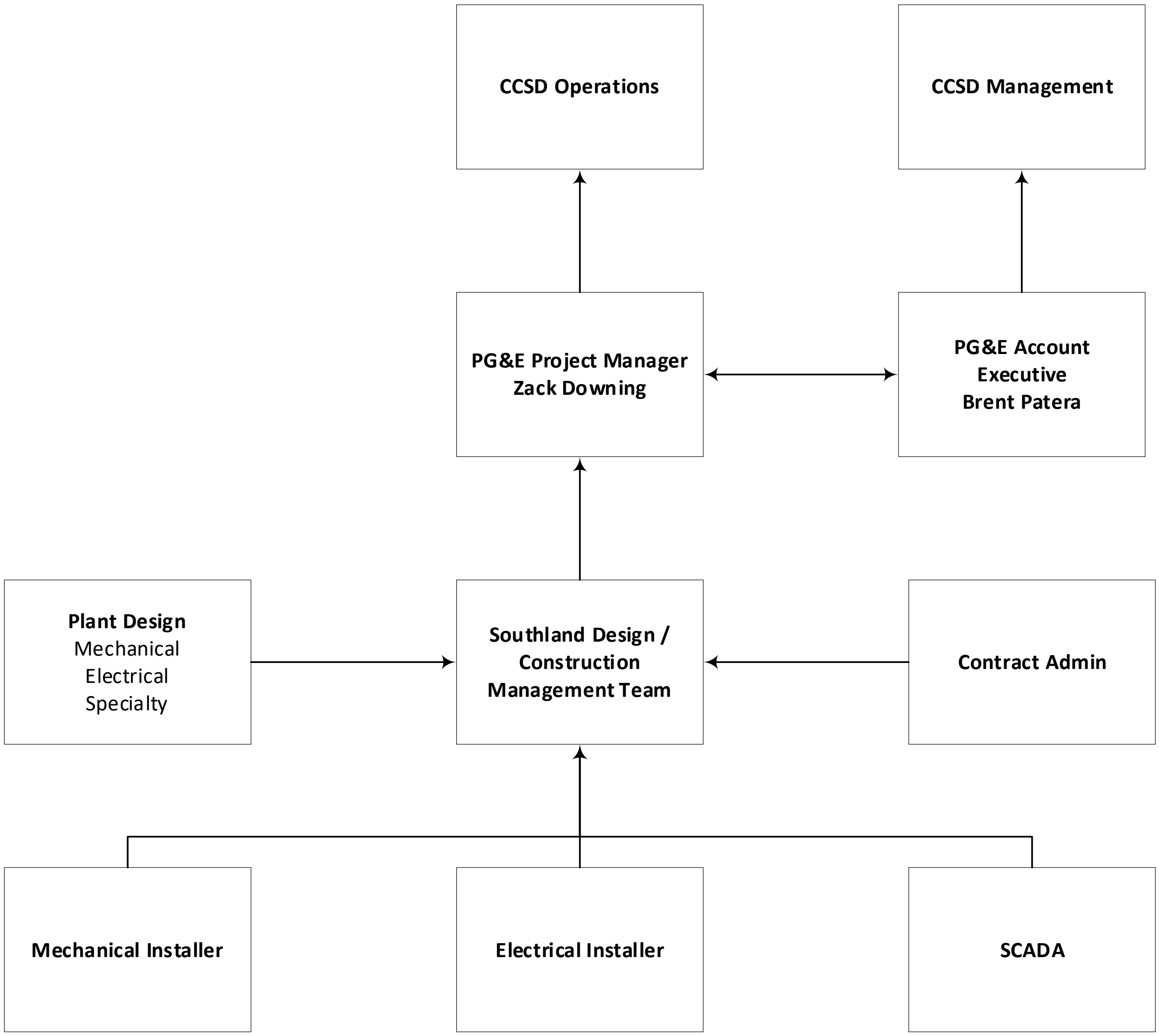
3.10.2.4 Firm Fixed Project Cost

PG&E's firmed fixed cost to construct the project as described is $7,527,063, as summarized below.

ECM #	Measure Description	Costs
1.0	Flow equalization (incl tank refurbishment)	$1,534,421
2.0	Influent lift station, baffle plate only	$18,261
3.0	Modified Ludzak - Ettinger upgrade	$1,223,778
4.0	Blower consolidation / replacement	$258,372
5.0	RAS / WAS improvements	$637,716
7.0	Replace transformer, new Y series breaker	$293,783
8.0	Generator replacement (now incl civil scope for electrical work)	$423,327
9.0	SCADA	$551,012
10.0	Secondary Water (3W) improvements	$318,202
	Pads for Electrical ECMs	$313,893
	Final Design	$308,394
	Project Duration / General Conditions Costs	$1,117,904
	Project Development - Sewer Fund	$528,000
	Total	$**7,527,063**

Note that the costs reflected in this firm fixed cost are only valid through December 31, 2021.

3.10.2.5 Project Implementation Team



3.10.2.6 Preliminary Construction Schedule

Task Name	Duration	Start	Finish
Cambria WWTP Draft Schedule	**21.55 mons**	**Mon 1/17/22**	**Mon 9/11/23**
Precon	**10.3 mons**	**Mon 1/17/22**	**Mon 10/31/22**
NTP	1 day	Mon 1/17/22	Mon 1/17/22
Complete 100% Design	4 mons	Tue 2/8/22	Mon 5/30/22
District Review	6 wks	Tue 5/31/22	Mon 7/11/22
Equipment lead times	16 wks	Tue 7/12/22	Mon 10/31/22
Construction	**12.25 mons**	**Tue 11/1/22**	**Mon 10/9/23**
WWTP	**12.25 mons**	**Tue 11/1/22**	**Mon 10/9/23**
Mobilization	5 days	Tue 11/1/22	Mon 11/7/22
ECM 1	2 mons	Tue 11/8/22	Mon 1/2/23
ECM 2 Influent Lift Stations- No DW	1 mon	Tue 11/8/22	Mon 12/5/22
ECM 3 Modified Ludzack Ettinger Upgrade	2 mons	Tue 2/28/23	Mon 4/24/23
ECM 4 Blower Consolidation/Replacement - No DW	1 mon	Tue 4/25/23	Mon 5/22/23
ECM 5 RAS/WAS Improvements	1 mon	Tue 5/23/23	Mon 6/19/23
ECM 7&8 Pads for electrical	1 mon	Tue 6/20/23	Mon 7/17/23
ECM 10 Secondary Water (3W) Improvements	1 mon	Tue 7/18/23	Mon 8/14/23
Testing and Cx	1 mon	Tue 8/15/23	Mon 9/11/23
Punchlist	1 mon	Tue 9/12/23	Mon 10/9/23
Generator And Electrical	**4 mons**	**Tue 11/1/22**	**Mon 2/20/23**
ECM 7&8 Electrical	4 mons	Tue 11/1/22	Mon 2/20/23
SCADA	**2 mons**	**Tue 11/1/22**	**Mon 12/26/22**
SCADA Install	2 mons	Tue 11/1/22	Mon 12/26/22
Closeout	**2 mons**	**Tue 10/10/23**	**Mon 12/4/23**
Training	1 mon	Tue 10/10/23	Mon 11/6/23
Closeout Packages	1 mon	Tue 11/7/23	Mon 12/4/23

Note: Preliminary schedule provided above as context for overall construction intervals. An updated schedule reflecting expedited and/or condensed construction for priority measures will be provided following receipt of notice to proceed (NTP) from CCSD.

3.11 Design and Drawings

Detailed designs including drawings, specifications and SCADA sequences / points list can be accessed electronically on Southland's file-sharing site. CCSD staff already has access to this site and has copies of all documents.

4 Next Steps

4.1 Sewer Fund Base Project

In order to avoid expiration of bids and to expedite the construction of seasonally vulnerable scope, PG&E suggests the following steps and timeframes for the Base Project:

Staff Report / Submittal for Board Agenda	November 8, 2021
Board Approval	November 18, 2021
Letter of Intent / Notice to Proceed	November 24, 2021
Contract for Construction	December 16, 2021

4.2 Additional Sewer Fund Measures

Implementation of additional Sewer Fund measures identified in this report is contingent on CCSD's financial capacity. PG&E is happy to assist CCSD staff in defining the revenue required to fund these measures, facilitate future additional financing and implement the measures at a future date.

4.3 Water Fund Measures

The IGA contract specified a conceptual assessment, design and costing for Water Fund measures. These are presented in the Water Fund Measures section of the report. If CCSD wishes to proceed to detailed costing and implementation of these measures, an IGA-level assessment and design exercise will be required. PG&E is prepared to commence this scope within one week of receiving approval to do so.

4.4 General Fund Measures

The IGA contract specified a conceptual assessment, design and costing for General Fund measures. These are presented in the General Fund Measures section of the report. If CCSD wishes to proceed to detailed costing and implementation of these measures, an IGA-level assessment and design exercise will be required. PG&E is prepared to commence this scope within one week of receiving approval to do so.

5 Appendix 1: Additional Sewer Fund Measures (NOT Included in Base Project)

The following ECMs were thoroughly investigated and advanced to the 30% design stage. Each measure has been identified as a necessary upgrade but CCSD has chosen to proceed with higher priority items first. Consequently, these measures are not included in the total project cost identified above.

5.1 Additional Influent Lift Station Modifications Not Included in Base Project – Summary

5.1.1 Existing Condition

The WWTP influent lift station utilizes three 25-hp constant speed suction-lift pumps to lift incoming sewage into the treatment process. The pumps operate based on wet well level. The pumps are oversized compared to current flows, since the plant was designed and constructed before water conservation became a common practice. The middle pump does not hold prime, and downstream processes can overflow when two pumps run.

5.1.2 Proposed Solution

Supplemental to the modifications provided in ECM 2 of the Base Project, this ECM will include installing new higher efficiency submersible pumps with variable frequency drives (VFDs). The pumps would be sized to operate more efficiently at existing flows, while ensuring all pumps can pass a minimum 3-inch solid to prevent clogging. The influent wet well will be re-coated and new access hatches will be provided for maintenance of submersible pumps. Baffling will be considered to minimize aeration and prevent cavitation and binding. This ECM complements influent flow equalization (ECM 1 above), but could also be implemented without construction of equalization.

5.1.3 Benefits

- Reduces energy usage by installing appropriately sized pumps and VFDs
- Eliminates existing priming problem in middle pump and improves pump reliability
- Improves balance of running hours between pumps to extend pump life
- Addresses needed repair/replacement project identified in Capital Improvement budget
- Extends useful life of influent wet well by repairing and replacing coatings
- Eliminates existing condition that can cause one pump to cavitate and run continuously, requiring a second pump to operate at the same time
- Can be programmed to perform self-cleaning functions within the wet well and incoming sewer

5.1.4 Potential Savings

Controlling the pumps with a VFD would allow the pumps to operate at reduced speeds, which would decrease fluid velocity in the discharge piping and minimize friction head losses.

Retrofitting the existing influent lift station with submersible pumps on VFDs could reduce average pumping rate by approximately 30%, resulting in lower losses and more efficient pumping. However, pumps would have to operate for longer duration to pass incoming flows. Based on our calculations and assuming an average daily flow (ADF) of 0.539 MGD, the average reduction in electrical consumption would be approximately 16,300 kWh/year or $2,800/year (at $0.171/kWh).

Although the electrical savings associated with this ECM are modest, the benefits to overall operations, reliability, plant efficiency, and maintenance should be carefully considered.

5.2 Sludge Thickening

5.2.1 Existing Condition

Operators pump WAS and sludge from the secondary clarifiers to the sludge holding tank (unused clarifiers) overnight. One sludge tank holding cell is continuously aerated to meet San Luis Obispo County Air Pollution Control District (APCD) odor-mitigation requirements, and sludge from the second cell is transferred to another basin prior to being delivered to the screw press. Holes in cell partition walls allow sludge to leak into adjacent cell. Supernatant is pumped to another cell and some flow is returned to the headworks every other day. The screw press receives approximately 2% solids and operates five days per week, nine hours per day. The sludge storage tanks (repurposed steel clarifiers) have exceeded their useful life. Holes and structural failures are apparent in walls separating sludge storage cells. Due to continuous aeration, the sludge does not thicken readily and requires multiple pumping operations to process solids and ultimately convey them to the screw press.

5.2.2 Proposed Solution

This ECM will include demolition of the two existing (unused) secondary clarifiers, construction of two new 70,000-gallon steel aerated sludge stabilization tanks, rehabilitation of the sludge thickening system, and improvements to the screw press. During design, further evaluation of this ECM will be conducted to determine the most cost-effective method for biosolids handling – either a biosolids handling and storage area to manage dewatered solids or direct discharge to roll-off containers.

5.2.3 Benefits

- Reduces energy usage by installing more efficient pump transfer and sludge aeration systems
- Replaces mechanical equipment which has failed and/or reached the end of its useful life
- Improves solids dewatering and reduces hauling costs
- Reduces burden on staff
- Increasing the de-watering by approximately 5% will reduce hauling costs by over $2,500/year

5.2.4 Potential Savings

The energy savings for this ECM are minimal; however, renewing the system would result in some annual maintenance and repair and replacement savings. Additionally, increasing de-watering by 5% would reduce annual tonnage removed by approximately 55 tons resulting in additional savings.

5.3 Sewer Lift Stations

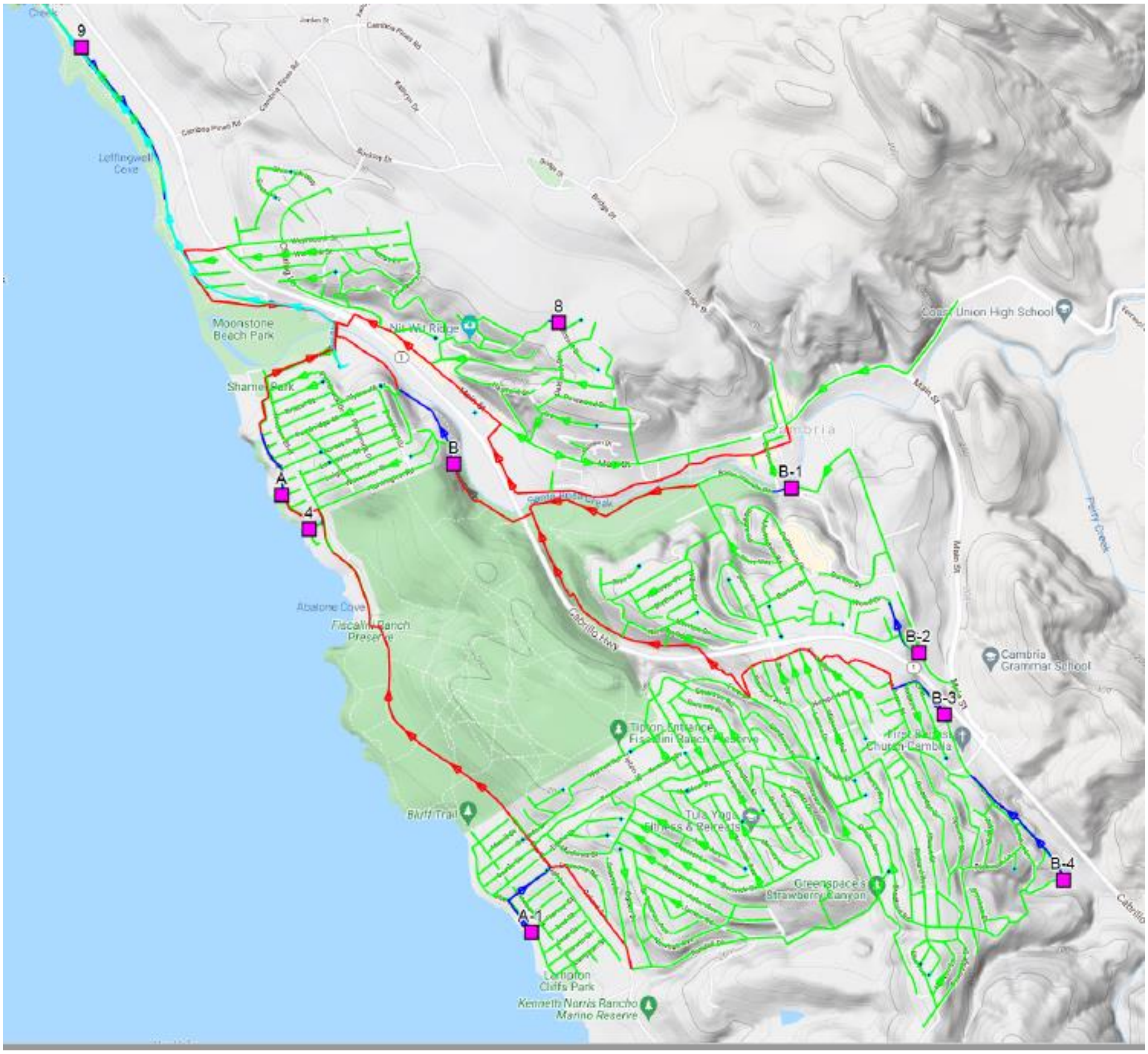


Figure 20: District Sewer Lift Stations

5.3.1 General Existing Condition

The District maintains and operates ten (10) sewer lift stations to convey sewage to the wastewater plant. Most of the District's lift stations have a "dry well/wet well" configuration featuring two pumps for lead/lag operation.

Based on operating data from 11/1/2016 – 11/30/2018, pumps at District lift stations operate more than 20,600 hours per year. In addition to the benefits associated with retrofitting with premium efficiency motors and more appropriately sized pumps, the District will benefit from converting from obsolete dry-well lift station configurations which are inefficient, require significant ongoing maintenance, and are a safety hazard for District personnel.

Maintenance or repair at the majority of the lift stations requires work to be conducted in a "confined space" as defined and regulated by the Division of Occupational Safety and Health (Cal/OSHA).

The District sewer collection system was constructed in the mid-1970s. Few improvements have been made since original construction. Due to water conservation measures implemented in recent years, a common issue at District lift stations is oversized pumps. Oversized pumps consume more energy due to high velocities and associated high friction losses. Additionally, oversized pumps cycle more frequently both shortening pump life and unnecessarily increasing electrical use.

The District's Capital Improvement plans include raising electrical panels above grade as a first phase, then converting dry/wet pit lift stations to submersible lift stations.

Table 5: Sewer Lift Station Pumps

Lift Station No.	Manufacturer and Model No.	Pump Type	Qty	Pump Motor (hp)
A	Crown PO6LB-12F	Suction Lift	2	7.5
A1	Ebara Self-Priming	Suction Lift	2	10
B	Ebara Self-Priming	Suction Lift	2	25
B1	Crown PO4LB	Suction Lift	2	5
B2	Crown PO4LB-8D	Suction Lift	2	15
B3	Crown PO4LC	Suction Lift	2	10
B4	Allis Chalmers 400 SER	Suction Lift	2	40
9	Ebara C-EFQT6A	Suction Lift	2	10
4	Paco/58-47001-QDN	Submersible	2	1.5
8	Paco/58-47001-QDN	Submersible	2	1.5

5.3.2 Project Description and Proposed Solution

a. Lift Station A

This is a triplex dry well/ wet well lift station (only two pumps installed) and features a below grade vault housing a 55-kW diesel generator. Lift Station A is located west of the intersection of Nottingham Drive and Leighton Street. The lift station is located on a costal bluff and is approximately 130-feet from the ocean.

Due to the lift station's limited area, replacement of the lift station in the same location as the existing wet well and dry well will be required. The existing wet well and drywell would be removed and replaced with a new wet well with two submersible pumps. A new buried valve vault would also be constructed and would be connected to the existing force main pipe upstream of the flow meter located within the existing below grade generator vault. Lift station controls would be placed above grade and a low-profile type panel would be specified to reduce impact to costal views. Full time bypassing would be required during construction. Bypass pumps could be placed within the existing manhole just upstream from the existing wet well at the edge of the paved road. A new manhole would be required to intercept flows coming in of the wet well from the south.

b. Lift Station B1

Lift Station B-1 is located north of Burton Drive and west of Village Lane behind the building supply yard and adjacent to Santa Rosa Creek. The existing lift station consists of a wet well, two pumps located in a dry well, and an above grade motor control cabinet (MCC). The District has placed a trailer mounted generator for standby power during outages. The slope located to the south of the lift station site (Burton Road embankment) has slid into the lift station site and has encroached on the MCC and electrical service. The lift station site is also located within the flood plain of the creek and has experienced flooding during large winter storms. A new lift station consisting of a wet well with two pumps and below grade vault can be constructed to the north of the existing lift station. This would allow the existing lift station to remain in service while the new one is constructed. The wet well and valve vault will include flood proof access hatches to limit water intrusion during flood events. A new electrical meter, MCC and permanent emergency generator could be constructed in the north east corner of the site. These items would be located on a raised concrete platform above the established flood elevation.

As an alternative, it may be possible to eliminate the lift station entirely by installing a new gravity sewer line between Manholes 1 and 12. Construction may require horizontal directional drilling and/or construction of an inverted siphon crossing Santa Rosa Creek.

c. Lift Station B4

Lift Station B-4 is located to the south of Gleason Street and to the west of Green Street. The existing lift station consists of a wet well, two pumps located in a dry well, MCC and a permanent emergency generator. The existing pumps are 40-hp and can overwhelm Lift Station B-2 which is downstream of the Lift Station B-4 force main discharge point. A new lift station consisting of a wet well with two pumps and below grade vault can be constructed to the north of the existing lift station. This would allow the existing lift station to remain in service while the new one is constructed. A new manhole would be required on Gleason Street to intercept flows into the new wet well. To reduce impacts to the downstream collection system smaller pumps may be considered. Pump capacity could be reduced from 340 gpm to 260 gpm and still maintain velocities within the force main to re-suspend solids when the pump turns on. The new lift station would include VFDs to allow a lower flow during average flow periods (260 gpm) and higher pumping rates (340 gpm) during wet flow periods as it has been reported that the upstream collection system can experience significant inflow and intrusion (I & I). An existing drainage swale located to the west of the lift station site may require relocating further to the east to allow construction of the new lift station. In addition, it may be beneficial to raise grades between the new lift station and drainage swale to provide further protection from water intrusion.

d. Lift Stations 4 & 8

Lift Stations 4 & 8 consist only of a wet well with two submersible pumps but these pumps are no longer supported by the manufacturer and parts are difficult to obtain. Improvements recommended for Lift Station 4 include replacement of pumps, rails, and lift station control panel. Improvements recommended for Lift Station 8 include replacement of pumps and rails.

e. Remaining Lift Stations

The following five lift stations make up the remainder of the lift stations in the District's collection system:

- Lift Station A1
- Lift Station B
- Lift Station B2
- Lift Station B3
- Lift Station 9

In general, each lift station could benefit from upgrades to improve efficiency, operations, and resiliency.

5.3.3 Benefits

- Reduces energy usage by replacing inefficient pumps and matching pump capacity and flow
- Eliminates confined-space safety hazards
- Reduces sanitary sewer overflow (SSO) risk and Improves resiliency for critical infrastructure
- Upgrades aging infrastructure

5.4 Additional Sewer Fund Measures – Summary of Costs and Savings

Item	Cost	Savings
Sludge storage improvements (North Tank Rehab)	$1,393,341	$13,895
Tertiary treatment	$889,436	-
Lift stations (Pricing is for A, B4, 4, 8 only)	$2,128,564	$5,000
Storm drain	$130,521	-
Demolish old tanks	$567,815	-
Totals	**$4,541,862**	**$18,895**

6 Appendix 2: Preliminary Assessment of Water Fund Measures

In addition to detailed assessment of the Sewer Fund items, the IGA commissioned PG&E to conduct preliminary assessment of various Water Fund items. This was to include preliminary scope and cost development to allow CCSD to determine whether and when to proceed with further development on any or all of these measures.

6.1 Well Sites

6.1.1 Existing Condition

CCSD has two groundwater sources, the San Simeon Creek Aquifer and the Santa Rosa Creek Aquifer. There are three wells that draw from the San Simeon Creek Aquifer and two that draw from the Santa Rosa Aquifer. The water is pumped directly into the distribution system. Well pump operations are controlled by the water level in the Pine Knolls storage tanks, which controls the lowest pressure zone in the system. Information on each well is shown below in ***Table 6***.

Table 6: Well Pump Information

Pump Name	Pump Type	Pump Make	Pump Motor (hp)	Aquifer	Location	Design TDH (ft)	Design Flow (gpm)	Pump Test Efficiency
SS-1	Vertical Turbine	Floway	50	San Simeon Creek Aquifer	GPS coordinates 35.60039, -121.1089 Between San Simeon Creek and San Simeon-Monterey Creek Rd	338[1]	400[1]	62%
SS-2	Vertical Turbine	Floway	50	San Simeon Creek Aquifer	GPS coordinates 35.60113, -121.1092 Between San Simeon Creek and San Simeon-Monterey Creek Rd	338[2]	400[2]	65%
SS-3	Vertical Turbine	Floway	50	San Simeon Creek Aquifer	GPS coordinates 35.60113, -121.1108 Between San Simeon Creek and San Simeon-Monterey Creek Rd	338[3]	400[3]	64%
SR-3	Submersible		25	Santa Rosa Aquifer	GPS coordinates 35.56423, -121.0803	66	493[4]	60%
SR-4	Submersible		60	Santa Rosa Aquifer	GPS coordinates 35.56795, -121.0706 Off of Santa Rosa Creek Rd, near Coast Union High School	308[4]	600[5]	57%

Notes:

[1]Pump test results indicate it is currently running at 304 ft and 400 GPM.

[2]Pump test results indicate it is currently running at 290 ft and 435 GPM.

[3]Pump test results indicate it is currently running at 306 ft and 420 GPM.

[4]Pump test results indicate that this operating point was measured at 41Hz. SR-3 is not currently in use

[5] Pump test results indicate it is currently running at 338 ft and 382 GPM.

The SS-1, SS-2, and SS-3 wells make up a wellfield that draws from the San Simeon Creek Aquifer. A fourth well, SS-4 exists but is not in use. SS-2 is the well that sees the highest water production each year, while SS-1 is typically run when the San Simeon Creek Aquifer is flowing, from May to October. SS-3 is only operated in the winter for very few hours. The SR-4 pump draws from the Santa Rosa Aquifer. Lastly, SR-4 is considered a backup well, to provide water during high demand.

The San Simeon Wells are served by two 50-hp vertical turbine well pumps, SS-1 and SS-2. SS-2 is the main well that operates for 8 hours per day in the winter, and 12 hours per day in the summer. SS-1 operates similarly to SS-2, but only during the summer months. The SS-2 well pump conveys water through 3 miles of 14-inch pvc water line prior to interconnecting with the water distribution system.

SR-4 is one of Cambria CSD's larger wells, utilizing a 60-hp submersible pump to transport water through the distribution system. SR-4 well pump operates at approximately 65% pump efficiency.

According to pump selection from Peerless Pumps, a replacement submersible pump is suitable that meets the operating conditions at an optimal pumping efficiency of 82% for SR-4., which is a 17% efficiency gain over the existing pump.

Operation of the well pumps are controlled based on the water level in the Pine Knolls Tanks.

6.1.2 Preliminary Solution

This project will replace SS-1, SS-2, SS-3, and SR-4 pumps with new pumps of the same type and design point. The goal is to increase the efficiency of the old pumps through these replacements. SS-1 and SS-3 pumps are assumed to be set at 105 ft, while SS-2 is to be set at 80-feet. The SR-4 well has a groundwater depth of 100-feet.

Peerless Pump provided recommendations and cost estimates for replacing each pump. The SS-1, SS-2, and SS-3 pump recommendation is the Peerless Vertical 9LA model, which has an efficiency of 80.1%. The cost for SS-1 and SS-3 is $44,560.58, while the SS-2 pump is $42,847.93. The cost differs between SS-2 and the other San-Simeon pumps because it is at a higher setting. The SS-4 recommendation is the Peerless Vertical 12LDT, which is submersible. The efficiency is 82.1% and would cost $57,519.09.

6.1.3 Benefits

- Reduces the amount off equipment to operate and maintain
- Reduces energy usage by installing high efficiency pumps with more refined flow ranges
- Reduces energy cost by approximately $4700 annually
- Replaces mechanical equipment which has failed and/or reached the end of its useful life
- Reduces burden on staff

6.2 Booster Stations

6.2.1 Existing Condition

The booster stations are used to bring water from lower pressure zones to higher ones. CCSD has pressure zones at three elevations. The gravity zone is the lowest elevation pressure zone, and well water is pumped into the distribution system for this zone. Water is then pumped into the middle zone using the Water Yard Booster Station. The middle pressure zone is controlled by the Stuart Street storage tank and is also the location of the Stuart Street booster station. This station pumps water into the upper pressure zone.

6.2.2 Preliminary Solution

This ECM will include replacement of all the pumps in ***Table 7*** with pumps of the same pump type and nameplate design point. The goal of this project is to increase the pumping efficiency with these new pumps.

Table 7: Booster Station Pumps

Pump Name	Pump Type	Pump Make	Pump Motor (hp)	Pressure Zone	Location	Nameplate TDH (ft)	Nameplate Design Flow (gpm)	Pump Test Efficiency
Rodeo Grounds Booster A	Centrifugal	Floway	60		On Rodeo Grounds Rd, near the dog park	227.1[1]	735[1]	82.44%[1]
Rodeo Grounds Booster B	Centrifugal	Floway	60		On Rodeo Grounds Rd, near the dog park	227.1[1]	735[1]	82.44%[1]
Rodeo Grounds Booster C	Centrifugal	Floway	60		On Rodeo Grounds Rd, near the dog park	227.1[1]	735[1]	82.44%[1]
Rodeo Grounds Fire Pump	Centrifugal	Floway	300		On Rodeo Grounds Rd, near the dog park	382.3[1]	2500[1]	83.20%[1]
Stuart St. Booster A	Centrifugal	Paco	50	From middle zone to Upper zone	Between Stuart St and Richard Ave, just south of Lawson Dr	296[2]	455[2]	60%
Stuart St. Booster B	Centrifugal	Paco	50	From middle zone to Upper zone	Between Stuart St and Richard Ave, just south of Lawson Dr	296	455	
Leimert Booster A	Centrifugal	Paco	7.5	None	Between Cambria Pines Rd and Bridge Street	120[3]	125[3]	19%
Leimert Booster B	Centrifugal	Paco	7.5	None	Between Cambria Pines Rd and Bridge Street	120[4]	125[4]	14%

[1]No pump test data available

[2]Pump test indicates that the pump runs at 227.1 ft TDH and 735 GPM.

[3]Pump test indicates that the pump runs at 17 ft TDH and 38 GPM.

[4]Pump test indicates that the pump runs at 131 ft TDH and 12 GPM.

Peerless Pump Company provided quotes for all the booster pumps above. They recommended the model 4AE10G for the booster pumps and the model 6AE12 for the fire pump. The efficiency of these two models at their design points are 79.8% and 74.6%, respectively. Although the old pumps were more efficient when installed, the efficiency has most likely decreased. The three Rodeo Grounds booster pumps would cost $37,009 total, or $12,336 per pump, and the fire pump would cost $88,302.

Rodeo Ground Pump Station

The existing Rodeo Grounds Pump Station (RGPS) is located within the flood plain of Santa Rosa Creek. One of the primary objectives is to relocate the facility outside of the flood plain to improve reliability of the pump station. The District also desires to upgrade the pump station with newer, more efficient pumps, a more robust control system, and an emergency backup generator.

The proposed pump station is to be housed in a masonry building to match the look of the surrounding architecture and overall feel of the community and park area. It will include the four pump assemblies and a surge anticipator valve. It would also include the instrumentation and control features, such as motor control centers (MCCs) for operation of the facility.

RGPS will also include a natural gas-powered engine-generator that will be utilized for emergency standby operation of the facility. The operation of the engine-generator will be based on a commercial power outage in the standby mode.

RGPS has been identified to have four pumps in parallel within the facility. The existing pump station will be demolished and relocated to a new location in the Cambria Community Park. Three of the pumps will be identically sized at 735-gallons per minute (gpm). These three pumps will be vertical turbines and sized to meet the daily operating hydraulic parameters for the pumping station. They will be designed for standard operation as two primary pumps and one standby pump. The fourth pump will be sized to meet fire flow scenarios and proposed fire flow pump capacity of 2,500 gpm.

Vertical turbine pumps were preferred over horizontal end suction pumps in the pump selection process because they provide several advantages. Vertical turbine pumps require a much smaller floor space allowing for minimal building size and layout. They also allow for a lower net positive suction head (NPSH) than horizontal end suction pumps. Also, priming is not required because the bowl assembly is submerged in the fluid being pumped. Furthermore, pressure requirements are easily met with the multi-stage design of vertical turbine pumps.

The pump control valves on the discharge side of the pumps will be Cla-Val Model 660-73 sized as a 10-inch and 14-inch model. The pump control valves will start off in the closed position as the pump is called to operate. The pump will be a soft start vertical turbine pump. As the pump develops pressure against the valve, the valve will open slowly to allow flow into the system. Preliminary selection indicated that 10-inch valve will be utilized within the system.

A surge anticipator valve is included within the system to help reduce the potentially damaging effects from hydraulic transients within the system. The valve selected for installation is a Cla-Val Model 652-

01. The valve has been sized as a 10-inch model. The pressure reducing and surge anticipator valve will reduce high discharge pressures to a constant lower downstream pressure. In the event of a hydraulic surge, the valve will sense the rapid increase in pressure and the surge pilot control on the valve will open rapidly to dissipate the increase in pressure.

The pump station will include a discharge flow meter that will read and transmit the discharge flows to both Zone 2 and Zone 7. Based on discussions with the District, it is desirable to include two Mag Badger Meters (one for Zone 2 and one for Zone 7).

A standby engine-generator will be included as part of the facility. The engine-generator will be sized to operate the pumping station in the event of a commercial power outage. The engine-generator will be a self-contained unit. The unit will operate within the pumping station; therefore, sound attenuation and heat dissipation through ventilation will be required. The unit will be diesel engine or natural gas driven. The engine-generator is primarily sized at 400 KW.

Butterfly isolation valves will be located throughout the facility for ease of removing and maintaining the facility equipment. The valves will be AWWA standard butterfly isolation valves.

The pump station will include a thermostatically controlled ventilation system to move air through the facility and assist with heat dissipation. It is presently not anticipated to include any air conditioning units within the facility. The air changes within the pump station are anticipated to be a minimum of eight per hour.

Operation of the RGPS will consist of the pumps boosting water within Zone 1 and to Zone 2 and 7 as needed. The operators will have the ability to select which pumps to be operational and their sequencing. The backup pump will be used when one of the maximum day pumps is being serviced. The 2,500 gallon per minute fire flow pump will only be operated during fire flow or other emergency situations. The PLC will have local default pump sequencing programmed into it as well as the ability to control operation based on time of use. If a given pump is called and fails to run, the next pump in sequence will be called.

The pump station will be served at 480 volts for pumps and large loads and this voltage will be transformed to 120 volts for control and low power usage. The motor control center will be equipped with an automatic transfer switch for connection to the generator.

A layout and section of the pump station, based on the information and equipment selections discussed in the previous sections, have been completed. The pump station will be located within the proposed Rodeo Grounds Park and will be situated in the Northeastern corner of the planned Cambria Community Park. The District wants the flexibility to have treatment facilities outside of the pump station. The footprint should also have sufficient footprint to include wellhead treatment as requested by the District. The architectural preferences for the pump station are rustic, equestrian, and rodeo with non-flammable materials.

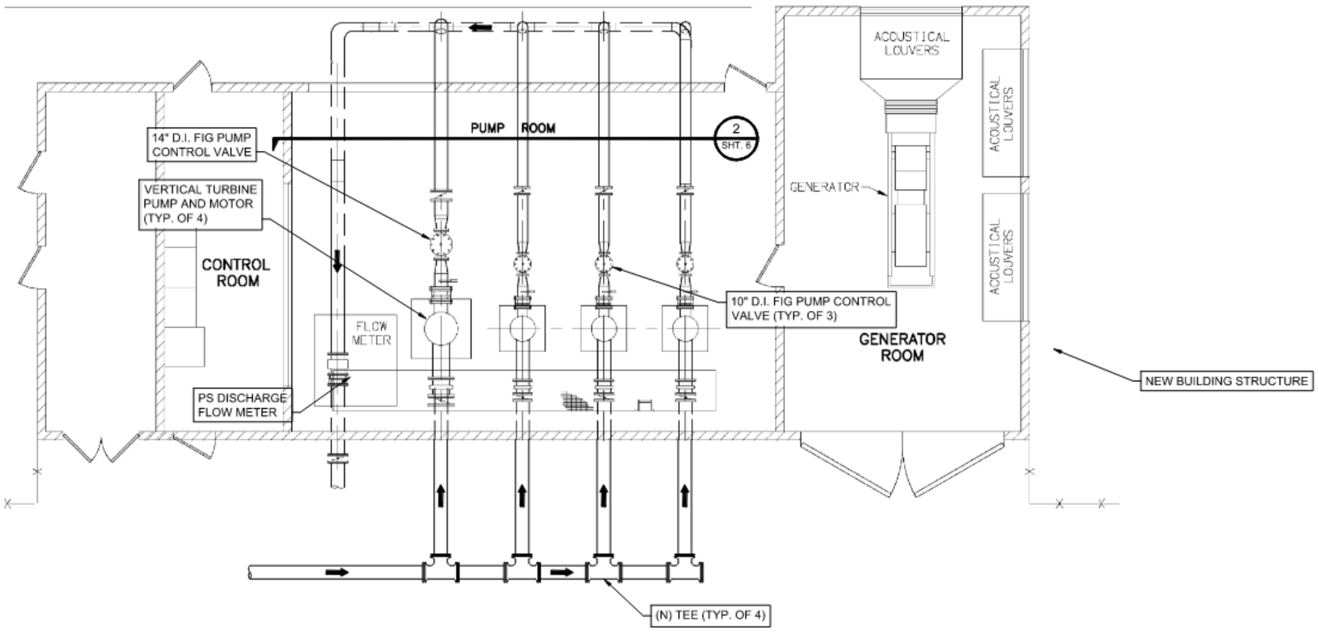


Figure 21: RGPS Building Layout

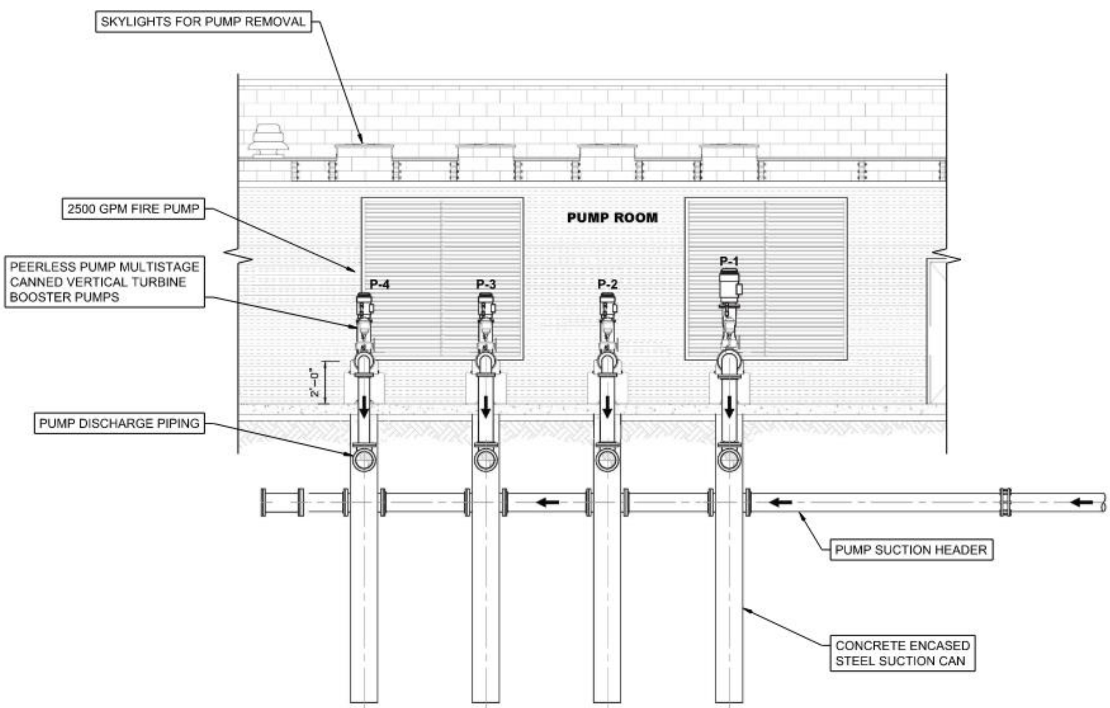


Figure 22: RGPS Pump Profile

6.2.3 Benefits

- Reduces the amount off equipment to operate and maintain
- Reduces energy usage by installing high efficiency pumps with more refined flow ranges
- Replaces mechanical equipment which has failed and/or reached the end of its useful life
- Reduces burden on staff

6.3 Domestic Water Tanks (Stuart Street)

6.3.1 Existing Condition

The Stuart Street storage tank facilities control the pressure in the middle pressure zone and are located between Richard Ave and Stuart Street, just south of Lawson Dr. The Stuart Street Tank III (Tank III) will be located on Stuart Street, south of the Stuart Street and Lawson Drive intersection. The proposed site is situated south of the existing Stuart Street Tanks, designated Tanks I and II, which are both above-grade steel-bolted tanks with a combined capacity of approximately 0.34 million gallons (MG). The existing tanks are constructed at an elevation of 441-feet with an overflow height of 24-feet. The site is accessed from Stuart Street and is directly adjacent to the residences to the north of the tanks.

6.3.2 Preliminary Solution

The solution evaluated was replacement of the existing two tanks with a third, single tank. The Stuart Street tanks are past their useful life and need to be replaced. Tank III is intended to mitigate supply deficiencies related to fire flow supply. A new welded steel tank with a storage volume of 365,000 gallons was assumed to accommodate for higher demands. The tank would have a diameter of 52-feet and an overflow height of 26.5-feet. The tank will have a high-water level matching the system hydraulic grade line of 462-feet and a floor elevation of 439-feet.

An above-round, circular steel-welded tank offers the most cost-advantageous construction for Tank III; however, site conditions severely limit the size of the reservoir that can be constructed. Specifically, the maximum tank diameter that can be constructed south of Tank II is limited to 52-feet. This assumes Tank III could be added with a 5-feet minimum setback for construction. At a maximum shell height of 23-feet to match the existing tank shell heights (i.e. Tanks I and II), the resulting volume of 365,000 gal would meet the fire flow supply at 2,500 gpm.

Design considerations for Tank III include the following:

- Above grade steel construction
- High Water Lever (HWL) of 462-feet
- Water circulation consistent with Department of Health Services (DHS) requirements, i.e. a diffuser or separator
- Separate inlet and outlet pipelines 180 degrees apart
- Accessibility to valve vaults and structures
- Consideration for water circulation through the reservoir to assist with water quality
- Roof access hatches and man way access

- Roof access with stairs or through ladder
- Personnel walk around access and scaffolding
- Provisions for compliance with City's storm water quality provisions

Tank III will be designed with separate inlet and outlet pipes for increased circulation through the reservoir as well as reduced “dead zones.” The facility will include access, inlet and outlet pipelines, inlet altitude valve vault and outlet check valve vault. Electrical and instrumentation will be provided on the project and will be designed to communicate directly with the City’s SCADA system.

The electrical demands of Tank III are minimal, consisting primarily of lighting, controls, and telemetry, and will be served by a small 120 / 240-volt metering pedestal to be installed at the site. The telemetry system will communicate via radio to Rodeo Grounds Pump Station (RGPS) and will indicate tank water level and any intrusion of gates and/or tank hatches for security.

A hydraulically operated altitude valve will control the inlet to the tank. The altitude valve will be a Cla-Val Model 210-01 globe style valve. The valve will open as the tank level drops and will close upon the tank reaching the high-water level. All set points are hydraulically controlled and can be modified and adjusted in the field.

The outlet to the tank will include a check valve to allow flow out of the tank and prevent flow from entering the tank, except through the altitude valve. This design enhances the flow patterns through the tank. The check valve will be equipped with outside weights and a lever or air cushion to prevent slamming of the valve.

Access to the tank will be through the manway access and the hatch located on the top of the tank. The manway will be 3-feet by 3-feet. The hatch will be 6-feet by 8-feet. Interior access stairs or a ladder with intermediate platforms will be provided.

MKN contacted Paso Robles Tank to provide a budgetary cost estimate for the tanks, with the above assumptions. The estimated cost of the tank is approximately $495,000, which includes $340,000 for the steel tank, $85,000 for paint, and $70,000 for the tank foundation.

An opinion of probable cost (OPC) was prepared for the construction of the storage tank. The OPC was prepared in accordance with the guidelines of the American Association of Cost Engineers (AACE). According to the definitions of AACE, the budget estimate is prepared with the use of cost curves, layouts, and equipment details. It is normally expected that an estimate of this type would be accurate within +30% or -15%. These percentages should be viewed as statistical confidence limits and should not be confused with contingencies.

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.

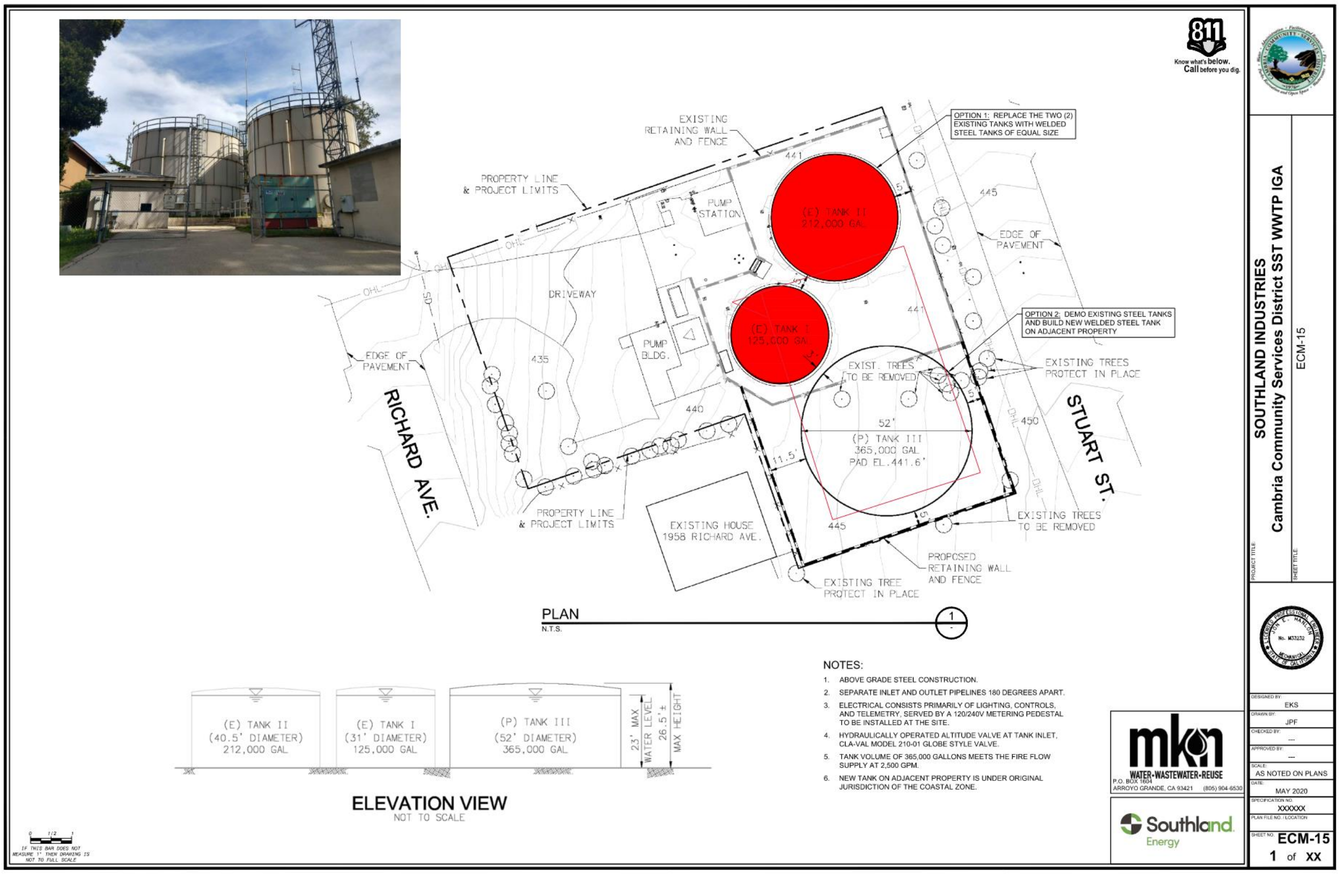


Figure 23: Stewart Street Tanks Site Plan

6.3.3 Benefits

- Replaces existing tanks which are at the end of useful life
- Coordinates storage with community demand and Fire Storage Requirements
- Improved reliability/efficiency of booster pump station

6.4 Water Fund Measures – Summary of Costs and Savings

These measures carry relatively high capital cost compared to the savings they produce. As such they should be considered in the context of an infrastructure upgrade as opposed to operating cost reduction measures.

Item	Cost	Savings
Well sites	$532,141	$4,733
Booster stations	$2,774,580	-
Domestic Water Tanks	$1,587,115	-
Totals	**$4,893,836**	**$4,733**

7 Appendix 3: Preliminary Assessment of General Fund Measures

7.1 Solar Photovoltaic (PV) System

7.1.1 Existing Condition

Electricity for the District's facilities are currently purchased from PG&E's electric grid. The District currently does not have any renewable solar photovoltaic (PV) energy generation system installed.

7.1.2 Preliminary Solution

This measure consists of installing a solar photovoltaic system rated at approximately 450 kWp at the San Simeon Well site. The proposed PV system will generate bill credits under the Renewable Energy Self-Generation Bill Credit Transfer (RES-BCT) Program to offset the electric costs at other District-owned facilities, including the waste-water treatment plant. The credits produced by the solar PV generation will offset 17 time-of-use electric (TOU) accounts in the District, thus providing electric cost savings to these accounts.

Cambria CSD San Simeon Well Site Cambria, CA 93428	Fixed Tilt Groundmount System 1,232 - 375W panels = 462 kWp	Rev: 04/21/2020

7.1.3 Benefits

The new PV systems will produce electricity without producing pollutants or greenhouse gas emissions that would otherwise come from the fossil fuel burning power generators. It will reduce the District's overall carbon footprint through renewable energy self-generation and help stabilize the District's budgets by reducing risk associated with the escalation of electric rates in the future.

7.2 Veteran's Hall Lighting

7.2.1 Existing Condition

The interior lighting at the Veteran's Memorial Hall is mainly fluorescent T8 lamps (32 watt) housed predominantly in 1x4 wrap fixtures. Some rooms in the building are lit with round flush mount fixtures. The exterior lights of the building are HID wall packs. Generally, the interior lights are manually controlled, and the exterior lights are equipped with photo-cell controls that switch on at dusk and off at dawn.

The traditional T8 fluorescent lamps have a useful life of between 10,000 to 15,000 burn-hours "mean time between failure (MTBF)." Ballasts for these fixtures typically last 25,000 burn-hours MTBF. In practice, lamp and ballast life is dependent on actual operating conditions such as hours of occupancy, switching frequency, and original manufacture quality.

7.2.2 Preliminary Solution

The focus of this energy conservation measure is to reduce energy consumption of Veteran's Memorial Hall's interior and exterior lighting systems, improve efficiency, improve the life-cycle costs associated with the lighting systems, and standardize the components of these systems.

In general, the indoor lighting systems will be improved through the installation of TLED lamp replacements for existing linear fluorescent fixtures. Building exterior lighting will be improved through the installation of new exterior rated LED fixtures and/or LED lamp replacements.

7.2.3 Benefit

This ECM will reduce energy use by approximately 3,546 kWh annually, reducing the District's electricity cost by approximately $700. In addition, the much longer life of LED lamps (typically 50,000 hours) means lower maintenance expense.

7.3 District-owned Street Lighting

7.3.1 Existing Condition

Some of the lights illuminating the streets of Cambria are District-owned and the rest are utility-owned (PG&E). Most of the utility-owned lights have been converted to LED, while most of the District-owned lights are the older inefficient HID fixtures. The existing streetlights owned by the District are high pressure sodium (HPS) 100W fixtures, which provides an orange hue light. The District-owned fixtures are served through PG&E's LS2-A street lighting rate tariff, which applies a fixed usage and cost based on the lighting fixture type.

7.3.2 Preliminary Solution

This ECM proposes to replace the existing District-owned street lighting fixtures with compatible LED street lighting fixtures. The compatible LED fixtures will range from 25W-30W while providing comparable illumination and better color rendering index. This measure provides improve efficiency, improve the life-cycle costs associated with the street lighting systems, and standardize the components of these systems as much as is possible within the goals and financial constraints of this project.

7.3.3 Benefit

The proposed upgrades will increase fixture efficiency and lamp life and improve light quality while maintaining equal or greater light levels improving street security within the District. This measure will improve fixture life, reduce maintenance, and reduce energy use and costs associated with street lighting at the District.

7.4 General Fund Measures – Summary of Costs and Savings

These measures would only be pursued if they demonstrate an attractive payback. The Solar PV project is by far the largest of the three but has a payback of nearly 18 years. The lighting projects have good paybacks but are quite small with limited impact, and to date have not been a high priority.

Item	Cost	Savings
Solar PV	$1,648,551	$92,787
Veteran's Hall lighting	$3,560	$709
District-owned street lighting	$15,866	$2,708
Totals	$**1,667,977**	$**96,204**