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Digester and DAFT Electrical Systems Evaluation

Prepared for: San Jose/Santa Clara Water Pollution Control Plant

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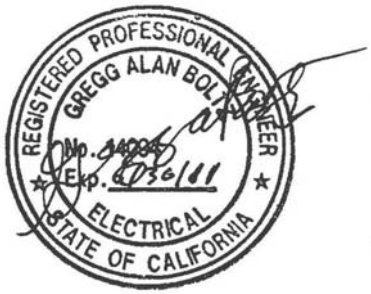

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1. INTRODUCTION

This Technical Memorandum (TM) presents the results of the electrical evaluation for the existing digesters and dissolved air flotation thickener (DAFT) systems at the San Jose/Santa Clara Water Pollution Control Plant (WPCP). The purpose of this TM is to estimate the power requirements for new equipment (i.e., pumping, heating, mixing, etc.) recommended in TM 5.0 (Implementation Plan) and recommend modifications to the digester area electrical system. The power requirements were determined assuming that all digesters are upgraded at some point in the future. In addition, recommendations are provided for the replacement of electrical equipment, including motor control centers (MCCs), conduit, and wire. The recommendations for replacement of electrical equipment are based on review of the 2007 Infrastructure Condition Assessment Report prepared by CH2M Hill, site visits by Brown and Caldwell (BC), and review of the WPCP Operations and Maintenance (O&M) Manual.

Although only four digesters will be upgraded as part of this project and a total of nine digesters are recommended for upgrade for the 2030 planning period, all sixteen of the existing digesters are considered in this TM. Therefore, electrical requirements were determined for all sixteen digesters. The equipment associated with each digester was determined from an examination of record drawings from previous upgrade projects and from WPCP electrical as-built drawings. The single line diagrams from these drawings for the MCCs feeding the digester and DAFT equipment were used to create a list of equipment dedicated to each digester as well as equipment that is common to the digester and DAFT systems.

The process equipment identified for removal and upgrade and their electrical load values are included in this review. All the equipment considered in the evaluation is connected to the power distribution system at 480 volts (V). The motor power load currents (amperes, A) used in this evaluation are values taken from Table 430.250 of the National Electrical Code (NEC).

1.1 Scope of Work

The following subjects are covered in this memo:

- An estimate the power requirements for new equipment (i.e., pumping, heating, mixing, etc.) recommended in TM 5.0 (Implementation Plan) and recommend modifications to the digester and DAFT area electrical systems.
- Results of an inspection of the existing electrical equipment in the digester and DAFT areas.
- A recommendation, if required, for replacement of electrical equipment, including MCCs, conduit and wire in conjunction with proposed modifications to the digesters and DAFT systems.

2. EXISTING CONDITIONS

2.1 Power Distribution to Digester and DAFT Areas

The equipment associated with the digester receive electrical power from three areas. Each area has 480V switchgear where 4160V (4.16kV) plant electrical power distribution voltage is reduced to 480V equipment utilization voltage via transformers. The 480V switchgears control distribution of power to MCCs where the power is further distributed to end-use equipment. Smaller step-down transformers connected to the MCCs provide 120V to panelboards for distribution to 120V equipment, lighting, and receptacle loads.

2.1.1 Switchgear Supplying Digester and DAFT Areas

The 480V switchgears presently supplying electrical power to the digester and DAFT areas are Switchgear S1, Switchgear S2, Switchgear S2A, and Switchgear S13. Another Switchgear S7 is in close proximity to the digesters, being located south of the gas storage tank, but apparently does not supply power to equipment associated with the digesters.

- **Switchgear S1:** Switchgear S1 is located north of the digester area in the Pump and Engine Building. It primarily supplies 480V power to the equipment where it is located via MCC-A (1600A rating). It also supplies MCC-B (800A rating) in the Digester Control Building via two 800A, 480V feeders from MCC-A. Switchgear S1 is a double-ended design with a tie breaker. The two busses are sometimes referred to as separate switchgears S1-1 and S1-2 in some WPCF documents.
- **Switchgear S2:** Switchgear S2 is located in the Sludge Control Building (SCB) east of Digester 6. It supplies 480V power to the equipment in the SCB and DAFT areas via MCCs G1 and G2. It also supplies MCC-M, which serves the primary clarifiers area. Switchgear S2 appears to have been installed in 1985/1986. The transformer supplying Switchgear S2 is a dry cast-coil type and appears to have been installed in 1998. S2 has space available to add another circuit breaker to feed a new MCC.
- **Switchgear S2A:** Switchgear S2A is located west of the Sludge Control Building, east of Digester 6. Like Switchgear S2, it also provides a source of 480V power to MCCs G1, G2, and MCC-M. Switchgear S2A appears to have been installed in 1986. The oil-filled transformer supplying Switchgear S2 appears to have been installed in 1986. S2A has space available to add another circuit breaker to feed a new MCC.
- **Switchgear S13:** Switchgear S13 is located in the Digested Sludge Export Pump Station Building (DSEPS). It is centrally located to the digesters when all digesters are considered, but it appears to primarily serve the digesters south of the DSEPS (Digesters 9 to 16). S13 supplies 480V power to the DSEPS Building and equipment via MCC-X1 and MCC-X2. It also supplies power to Digesters 9 to 16 and related equipment via MCC-V, MCC-Y1, and MCC-Y2. Switchgear S13 is a double-ended design with a tie breaker. The two busses are sometimes referred to as separate switchgears S13-1 and S13-2 in some WPCF documents.

2.1.2 MCCs Supplying Digester and DAFT Areas

The 480V power from switchgears is distributed to motor control centers before being distributed to final use loads. The MCCs that supply the digester and DAFT areas are:

- **MCC-A:** MCC-A is located in the Pump and Engine Building. It subfeeds MCC-B that primarily serves Digesters 1 to 4 via two 800A, 480V feeders.
- **MCC-B:** MCC-B is located in the Digester Control Building and supplies equipment associated primarily with Digesters 1 to 4, but some of the equipment may also serve systems that support the other digesters. Some of the equipment associated with the digesters that is connected to MCC-B includes digester liquor pumps, sludge recirculation pumps, sludge transfer pumps, heating water circulation pumps, and gas compressors. MCC-B is subfed from MCC-A via two 800A, 480V feeders.
- **MCC-G1:** MCC-G1 is located in the SCB and mainly serves gas handling equipment. MCC- G1 appears to have been installed in 2005 to replace obsolescent MCC equipment.
- **MCC-G2:** MCC-G2 is located in the SCB and supplies equipment associated primarily with the SCB, DAFT, and Digesters 5 to 8, but some of the equipment may also serve systems that connect to the other digesters. Some of the equipment associated with the digesters that is connected to MCC-G2 include sludge recirculation pumps, sludge transfer pumps, heating water circulation pumps, and gas compressors. MCC-G2 also serves some areas in the tunnels with power for sump pumps, ventilation fans, lights and receptacles. MCC-G2 appears to have been installed in 2005 to replace obsolescent MCC equipment.
- **MCCs-V, Y1, Y2:** MCCs Y1, Y2, and V are located above the tunnel between Digester 10 and Digester 16. MCCs Y1 and Y2 (800A rating) appear to have been installed in 1985. MCC-V (600A rating) appears to be

of similar vintage. Some of the equipment associated with the digesters connected to MCCs Y1, Y2, and V includes, sludge recirculation pumps, sludge transfer pumps, heating water circulation pumps, and gas compressors. They also serve some areas in the tunnels with power for sump pumps, ventilation fans, lights, and receptacles.

3. ELECTRICAL EQUIPMENT EVALUATION

This section provides an evaluation of the electrical distribution systems for the digester and DAFT areas. The information on existing power requirements is based on values from the existing drawings and the WPCP O&M Manual. The power requirements for future upgrades are based on the recommendations from other TMs prepared for this Service Order. Although only four digesters are to be upgraded as part of this project and nine total digesters are recommended for upgrade for the 2030 planning period, all sixteen of the existing digesters are considered in this TM. Assumptions are made for equipment upgrades to all digesters based on specific recommendations for the four digesters to be upgraded as part of this project.

3.1 Electrical Equipment Condition

3.1.1 Previous Assessments and Recommendations

The Infrastructure Condition Assessment Report by CH2M Hill (May 2007) noted several deficiencies associated with the existing electrical equipment for the digester facilities. Table 3-1 summarizes the deficiencies identified in the Infrastructure Condition Assessment Report. BC conducted site visits to confirm the items identified in the report and to make additional observations. Existing deficiencies and recommendations from the report include:

- **MCC-B:** The Infrastructure Condition Assessment Report noted that MCC-B that supplies power to Digesters 1 to 4 are in poor condition due to age and wear. Replacement is recommended. Replacement of its low voltage transformer and related panelboard is also recommended. Note that plant staff report they are planning for replacement of MCC-B.
- **MCC-V:** The Infrastructure Condition Assessment Report noted that MCC-V that supplies power to Digesters 9 to 11 is in poor condition due to age and wear. Replacement is recommended. Replacement of its low voltage transformer and related panelboard is also recommended.
- **MCC-Y1:** The Infrastructure Condition Assessment Report noted that MCC-Y1 that supplies power to Digesters 12 to 14 is in poor condition due to age and wear. Replacement is recommended. Replacement of its low voltage transformer and related panelboard is also recommended.
- **MCC-Y2:** The Infrastructure Condition Assessment Report noted that MCC-Y2 that supplies power to Digesters 15 to 16 is in poor condition due to age and wear. Replacement is recommended. Replacement of its low voltage transformer and related panelboard is also recommended.
- **Lighting:** The Infrastructure Condition Assessment Report noted that some minor lighting improvements are needed at the digesters. No detail was given on improvements needed, but implies that there is an issue with corrosion at the light standards on the digesters. Based on our observations, the lighting at the digesters should be further evaluated during detailed design.
- **Panelboards:** The Infrastructure Condition Assessment Report noted that some minor lighting panel improvements are needed at the digesters. No detail was given on improvements needed, but implies that there is an issue with corrosion with panelboards the digesters. Corrosion-resistant cabinets are recommended. Based on our observations, the panelboards at the digesters should be further evaluated during detailed design.
- **Control Stations:** The Infrastructure Condition Assessment Report noted that some minor control station improvements are needed at the digesters. No detail was given on improvements needed, but

implies that there is an issue with corrosion. Corrosion resistant enclosures are recommended. The control stations at the digesters should be further evaluated during detailed design.

- **Instrumentation:** The Infrastructure Condition Assessment Report stated that "Copper wire used for communication links throughout the Plant is corroded in many locations. The wire can be replaced with fiber optic communication systems that are less prone to corrosion." Based on our observations, the communication wiring at the digesters should be further evaluated during detailed design.

Table 3-1. Summary of Digester Improvements Recommended in the Infrastructure Condition Assessment Report prepared by CH2M Hill, May 2007

Potential Improvements	Digester 1	Digester 2	Digester 3	Digester 4	Digester 5	Digester 6	Digester 7	Digester 8	Digester 9	Digester 10	Digester 11	Digester 12	Digester 13	Digester 14	Digester 15	Digester 16
Replace MCC B and associated transformer	√	√	√	√												
Improve lighting, lighting panels and control stations with corrosion resistant cabinets	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Replace copper control wiring (Switches RP1 and RP2 to S800 Remote I/O)	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Replace MCC V and associated transformer and lighting panel									√	√	√					
Replace MCC Y1, MCC Y2, and associated transformer and lighting panel												√	√	√	√	√

Based on site visits and analysis, Brown and Caldwell generally agrees with the recommendations from the 2007 Infrastructure Condition Assessment Report.

3.1.2 Switchgear

The switchgear serving the digester and DAFT areas has reached its expected service life of 25 years. The equipment appears to be in relatively good condition. If put on a regular maintenance schedule, the life of this equipment can easily be extended to 50 years. The plant power system has adequate redundancy to allow scheduled maintenance of the switchgear without significantly affecting plant operations. If frequency of problems with the circuit breakers in the switchgear becomes an issue, retrofit of the switchgear with newer circuit breakers can be a cost effective way to extend service life of switchgear.

3.1.3 Switchgear Transformers (Unit Substation Type)

Some of the unit substation type transformers that step down voltage from 4160V to 480V for the digester and DAFT areas have reached the expected service life of 25 years. It is quite common to find transformers still in operation after 40 to 50 years of service. Most transformers do not operate at their design temperatures since they are not fully loaded. This greatly extends insulation life. Oil filled transformers typically have longer service life than dry-type transformers. This is primarily because they are enclosed and immersed in oil, protected from atmospheric elements and dust. In general, the transformers appear to be in relatively good

condition. If put on a scheduled maintenance program, the life of this equipment can easily be extended to 50 years.

The plant power system has adequate redundancy to allow scheduled maintenance of the transformers without significantly affecting plant operations. The transformer for Switchgear S2 was replaced in 1998. It is a cast-coil type, so should be less affected by dust than a conventional dry type, provided it is cleaned periodically to prevent excessive dirt buildup that could result in tracking. With proper maintenance, this transformer should be good for another 35 years of service. Life expectancy predictions for transformers are predicated on the assumption that the transformers are operated within the limits of their design ratings and are not subject to overload.

3.1.4 Motor Control Centers (MCCs)

As discussed above, the digester and DAFT equipment receive electrical power from MCCs B, G1, G2, V, Y-1 and Y-2 (also referred to as Y1 and Y2). These MCCs also feed other loads that are not specific to the digester area or any one digester.

- MCC-B was installed in 1955. MCC B should be replaced in the near future because of its age. Plant staff report that its replacement is being planned.
- MCCs G1 and G2 were installed in 2005 and are in good condition. MCCs G1 and G2 do appear to present single points of failure for the solids and gas handling systems for the plant, in that they do not have split busses, and loss of power to either results in loss of power to all similar types of equipment. This situation also makes maintenance of the MCCs problematic.
- MCCs V, Y-1, and Y-2 were installed in 1985 and are showing signs of degradation from use and from the elements. These MCCs are approaching the end of their expected useful life. Given a scheduled maintenance program, they could remain in service for another 10 to 20 years. They do not have sufficient space available to serve anticipated future loads. MCC-V has insufficient bus capacity (current rating) to serve future loads and the feeder circuits that supply MCC-V also have insufficient capacity for future loads.

3.1.5 Lighting Transformers

This equipment was not assessed in the field for this study, but the following general statements can be made. Most of the small dry-type transformers that serve lighting and other low voltage loads have reached the end of their expected service life of 25 years. As with larger transformers, it is quite common to find transformers still in operation after 40 to 50 years of service. Most transformers do not operate at their design temperatures since they are not fully loaded. This greatly extends insulation life. With good maintenance, the life of this equipment can easily be extended to 50 years. It is recommended that this type of equipment be replaced when the associated motor control center that it is connected to is replaced. Until replacement, the equipment should be on a scheduled maintenance program.

3.1.6 Feeder Cables (600V Class)

This plant cables were not assessed in the field for this study, but the following general statements about cables are offered. In general, high quality power cables have an expected service life of 25 to 30 years. Experience has shown cable life of 50 years or more is achievable. Also, cable life can be reduced with poor quality cable or poor installation. Assuming cable is not damaged during or after installation, life is mainly a function of the quality of the cable insulation and the operating temperature of the cable. As with other equipment, insulation life increases when operating temperature is less than design temperature for the cable. Motor cables tend to operate at the highest temperatures since they usually operate at a higher percentage of maximum rating than other equipment. Feeder cables to switchgear and MCCs quite often never or seldom

operate at maximum rated load (temperature). Most facilities deem it impractical to test cables because of the amount of testing required. Connections are checked periodically as part of the MCC and switchgear maintenance. High quality insulation (type RHW) is recommended to be used for critical equipment and the cables be replaced when the equipment is replaced. Earlier replacement of cables can be implemented if an unexpectedly high occurrence of cable failures makes additional attention to cables necessary.

3.1.7 Other Observations

- **Electrical Room Ventilation:** TM 4.3A describes that it was determined that the supply air for one of the MCC rooms is drawn from a gallery that is not compliant with National Fire Protection Agency (NFPA) 820 for an unclassified space. The ventilation of this area should be modified to assure that electrical room ventilation air is brought in from non-hazardous areas.
- **Additional Condition Assessment:** The scope and time allotted for the condition assessments in this memo were limited. Further evaluation will occur as part of the design phase of the rehabilitation project to determine if they have sufficient capacity and remaining life.

3.2 Power System Load Change Summary

3.2.1 Digester Electrical Load Changes

A summary of the changes for the digesters is provided in the following paragraphs:

Digesters 1 to 3: Currently, Digesters 1 to 3 each have one 20-horsepower (hp) sludge recirculation pump and one 30-hp gas compressor used for digester mixing. For the 2030 planning period, these digesters will not be needed unless they are used for pre-processing, storage, or digestion of additional import materials beyond fats, oil, and grease (FOG). For this electrical evaluation, the total new equipment assumed to be added to Digesters 1 to 3 after all are upgraded in the future consists of three 30-hp sludge recirculation pumps (three duty), four 20-hp digester feed pumps (three duty/one standby) and six 25-hp gas compressors (six duty). The 30 hp digested sludge transfer pumps associated with these digesters will not be changed.

Digesters 4 to 11: Currently, Digesters 4 to 11 each have one 30-hp sludge recirculation pump and one 30-hp gas compressor used for digester mixing that will be replaced in the future with new sludge recirculation pumps and new mixing systems. These digesters will be rehabilitated in phases. The first phase consists of an upgrade to Digesters 5 to 8. Anticipated changes in plant loading for upgrade of digesters 5 to 8 are summarized in Table 3-2 below. Table A-1 located in Attachment A provides a detailed breakdown of existing, removed, and new power requirements along with the associated MCC's name, age, and bus rating. Two of these digesters will be equipped with gas mixing, one will be equipped with mechanical draft tube mixers, and one will be equipped with either linear motion (LM) or focused flow mixers. The mechanical draft tube mixers, focused flow mixers, and gas mixers have similar power requirements. The LM mixers have lower power requirements. In order to assure adequate power and MCC equipment is available, BC recommends that all digesters be evaluated for the gas mixing equipment in the event that the other mixers are not proven to be successful at San Jose.

For this electrical evaluation, the total new equipment assumed to be added to Digesters 4 to 11 after all are upgraded in the future consists of: eight 40-hp sludge recirculation pumps (8 duty), twelve 20-hp digester feed pumps (8 duty/4 standby), twelve 30-hp gas compressors (12 duty), four 25-hp mechanical draft tube mixers (4 duty), and five 20-hp focus flow mixers (5 duty). The 30-hp digested sludge transfer pumps associated with these digesters will not be changed.

Digesters 12 to 16: Currently, Digesters 12 to 16 each have one 20-hp sludge recirculation pump and one 30-hp gas compressor used for digester mixing that will be replaced in the future with new sludge recirculation

pumps and new mixing systems. For this electrical evaluation, the total new equipment assumed to be added to Digesters 12 to 16 after all are upgraded in the future consists of: five 40-hp sludge recirculation pumps (5 duty), seven 20-hp digester feed pumps (5 duty/2 standby) and ten 40-hp draft tube mixers (10 duty). The 30-hp digested sludge transfer pumps will not be changed.

3.2.2 Solids Handling Electrical Load Changes

Anticipated changes to solids handling equipment in the Solids Control Building and DAFT area during the first phase of the digester upgrades include the following:

- Six 20-hp concentrated sludge pumps will be taken out of service.
- Six new 50-hp DAFT Float Pumps will be added.
- Two new 20-hp Blend Tank Mixing Pumps (one duty, one standby) will be added.
- Six new 5-hp Polymer Blending Units will be added.
- Two new 5-hp Odor Control Fans will be added.

The majority of the existing solids handling and DAFT equipment in this area receive power from MCC-G2. Despite the anticipated additional new loads, overall loading of MCC-G2 is expected to decrease because of digester equipment (gas compressors, recirculation pumps) being removed and because of a reduction in the number of DAFT units (six) needed to be in operation. MCC-G2 is the best location to power the new equipment. However, space constraints may require some of the new equipment to be connected to a new MCC located elsewhere.

3.2.3 Digester/Daft Load Change Effects on Electrical Equipment

Anticipated loading changes due to digester and DAFT improvements and their effect on the WPCP power system are summarized in Table 3-2 and discussed below (see Attachment A-1 for additional detail):

MCC-B: MCC-B provides power and control of equipment associated with Digesters 1 to 4. The equipment is obsolescent, and WPCP staff report they are planning to replace MCC-B with a new MCC rated at 1200A. Anticipated connected and operating (running) load current could increase to 1479A and 845A, respectively. Based on our observations, the new MCC have at least a 1600A rating and be divided into two sections with a tie circuit breaker. Presently, MCC-B is sub-fed from MCC-A. MCC-A does not have sufficient capacity to serve all future loads for Digesters 1 to 4 via MCC-B. The new MCC-B is recommended to be connected directly to an existing or new 480V switchgear, rather than continue being sub-fed through MCC-A. Two redundant feeders should be considered to the new MCC-B for reliability and ease of maintenance.

MCC-G1: No changes are necessary to MCC-G1 and no equipment will be added or removed.

MCC-G2: It is anticipated that modifications to the solids handling systems and DAFT systems will result in reduced loading of MCC-G2. This results in part from the ability to maintain thickening with fewer DAFT units. Also, some demolished equipment (gas compressors and sludge recirculation pumps) related to Digesters 5 to 8 will be disconnected from MCC-G2, with its replacement equipment being fed from different (new) MCCs located closer to the digesters. Modifications will be necessary to accommodate new or replaced equipment located in the Solids Control Building and the DAFT gallery. Connected load is expected to increase to approximately 1761A and running load is anticipated to be approximately 947A. Some existing starters may need to be replaced. It is beyond the scope of this memo to determine the modifications to MCC-G2 that will be necessary. At least 18 pieces of new equipment are expected to be connected to MCC-G2. This may require additional sections to be added. This would be problematic, as the electrical room in the Solids Control Building has very little space available for new electrical equipment. However, capacity of MCC-G2 is sufficient to serve the anticipated new loads. Preference would be to locate additional MCC

sections in the electrical room and connect to MCC-G2 as an extension of G2. Alternatively, new MCC equipment could be located elsewhere and fed from MCC-G2 or another source.

MCC-M: MCC-M serves the primary clarifiers area. Its condition was not assessed as it was not within the scope of the digester/DAFT upgrades. However, the MCC-M loading of Switchgear S2 and Switchgear S2A must be considered if switchgears S2/S2A are to be considered as a power source for new MCCs. Based upon the original design drawing (single line diagram) from 1961, MCC-M could draw as much as 100KVA.

MCC-V: Presently, MCC-V mainly serves equipment supporting Digesters 9 to 11. Anticipated connected and running load current could increase to approximately 741A and 641A, respectively. This is above the MCC-V rated capacity of 600A. In fact, the two feeders to MCC-V are presently only rated 300A and 350A. Additional MCC sections will be needed for additional motor controllers. When the time comes to upgrade Digesters 9 to 11, a new MCC will be needed. A split bus with tie breaker arrangement served by two redundant feeders to the new MCC-V is recommended for reliability and ease of maintenance.

MCC-Y1: Presently, MCC-Y1 mainly serves equipment supporting Digesters 12 to 14. Anticipated connected and running load current could increase to approximately 851A and 652A, respectively. This is below the MCC-Y1 rated capacity of 800A. However, an 800A feeder is marginally below what the NEC requires to serve this load in Article 210.20 unless 100 percent-rated circuit breakers are used. Additional MCC sections will be needed for additional motor controllers. When the time comes to upgrade Digesters 12 to 14, a new MCC will be needed. A split bus with minimum 1000A bus rating and tie breaker arrangement served by two redundant feeders to the new MCC-Y1 is recommended for reliability and ease of maintenance.

MCC-Y2: Presently, MCC-Y2 mainly serves equipment supporting Digesters 15 and 16. Anticipated connected and running load current could increase to approximately 683A and 569A, respectively. This is below the MCC-Y2 rated capacity of 800A. However, Additional MCC sections will be needed for additional motor controllers. When the time comes to upgrade Digesters 12 to 14, a new MCC will be needed. A split bus with tie breaker arrangement served by two redundant feeders to the new MCC-Y2 is recommended for reliability and ease of maintenance.

MCCs G3, G4: It is anticipated that two new MCCs will be installed to serve the new equipment for Digesters 5 to 8. For the purposes of this report, they are arbitrarily called MCC-G3 and MCC-G4. MCCs G3 and G4 could be one MCC with a split bus with tie breaker arrangement served by two redundant feeders, or separate MCCs with a tie feeder circuit to connect them. The MCCs will be located as close as possible to Digesters 5 to 8. Ideally, the MCCs would be located centrally, between the digesters. Other possible locations include the area north of the digesters between Digesters 5 and 6 and the area to the west between Digesters 5 and 7. The MCCs should receive power from two independent power sources. Possible existing power sources located nearby include 480V Switchgear S2, 480V Switchgear S2A, Switchgear S7 (DP4) and Switchgear S13 located at the DSEPS building. A new remote input/output (RIO) panel should be installed near the new MCCs to provide equipment monitoring and control interface with the plant distributed control system (DCS).

MCC-U: MCC-U is an existing MCC located in the building south of the gas storage tank. It once supplied a pilot plant that is no longer in service. It receives power from Switchgear 7 via a single feeder from distribution panel DP4. Being rated 600A, it has insufficient capacity to serve all the loads associated with the Digester 5 to 8 upgrades. However, it could be used to serve part of the new equipment. Extensive rework of the MCC would likely be necessary if starters for new equipment are added to MCC-U. There would also be logistic concerns of getting the conduit from new equipment at Digesters 5 to 8 to MCC-U.

Switchgear S2: Being located in the Solids Control Building, 480V Switchgear S2 has close enough proximity to make it a candidate to serve new equipment associated with the upgrade of Digesters 5 to 8. It has one spare breaker cell available that could be used to add a feeder breaker to supply a new MCC. The expecting increase in operating load of over 500KVA may exceed the switchgear capacity unless non-critical equipment

can be identified that can be turned off for extended periods of time while damaged equipment (switchgear, substation transformer, service cables) is replaced. Further analysis is necessary to confirm the switchgear has sufficient capacity to serve the anticipated additional loads.

Switchgear S2A: Being located west of the Solids Control Building, 480V Switchgear S2A is an ideal candidate to serve new equipment associated with the upgrade of Digesters 5 to 8. It has one spare breaker cell available that could be used to add a feeder breaker to supply a new MCC. The expected increase in operating load of over 500KVA may exceed the switchgear capacity unless non-critical that equipment can be identified that can be turned off for extended periods of time while damaged equipment (switchgear, substation transformer, service cables) is replaced. Further analysis is necessary to confirm the switchgear has sufficient capacity to serve the anticipated additional loads.

Switchgear S7 (DP4): Located south of the gas storage tank, Switchgear S7 supplies 480V distribution panel DP4. Though not ideally situated, it is still located close enough to be a candidate to serve new equipment associated with the upgrade of Digesters 5 to 8. Further analysis is necessary to confirm the switchgear has sufficient capacity to serve the anticipated additional loads. As discussed above, DP4 serves MCC-U that is presently lightly loaded. This implies enough capacity (450A or more) is available to serve at least part of the equipment for Digesters 5 to 8.

Switchgear S13: 480V switchgear S13 is located in the DSEPS Building. It is close enough to be a candidate to serve new equipment associated with the upgrade of Digesters 5 to 8 for an MCC located northwest, northeast, or south of Digester 7. The S13 location makes it less well suited to serve new MCCs farther away, but does not rule it out if needed. Switchgear S13 is the most centrally located switchgear with respect to the overall footprint of the total digester area. S13 is in close proximity to Digesters 1 to 4 if needed to relieve loading on MCC-B or its source switchgear (S1). Further analysis is necessary to confirm Switchgear S13 has sufficient capacity to serve the anticipated additional loads for Digester 5 to 8 upgrade or other digester upgrades in the future.

New 480V Switchgear: If an existing 480V switchgear cannot be determined to have sufficient reserve capacity to provide the required electrical power for the various phases of digester and sludge handling system upgrades, a new switchgear will need to be installed. Ideally, the switchgear would be located near the loads it serves. It should be a double-ended design if it serves multiple busses (MCCs), unless it is only needed as an alternate to another switchgear to serve the same loads. The switchgear(s) would be connected to the 4.16kV power system and receive power via step-down transformers, similar to the other 480V switchgears at the WPCP.

Electrical Power Metering: WPCF has been installing metering to allow the DCS system to monitor loading of various parts of the electrical power distribution system. As of March 11, 2011, the metering data for switchgear S2, S2A indicates that there is enough reserve capacity for switchgears S2/S2A to serve the additional loads required for the Digester 5 to 8 improvements. However, the gas compressors were not in operation for the period of time the load data was monitored by the DCS. When all the expected loads for MCC-G1 equipment are operating along with equipment supplied by MCC-G2, they appear above the individual capacities of Switchgear S2 and Switchgear S2A, when each switchgear is considered individually. This indicates that Switchgears S2 and S2A are not fully redundant power sources for the equipment they serve. It appears there could be sufficient reserve capacity if the power system loads are split among Switchgears S2 and Switchgear S2A if WPCF personnel can identify equipment that could be load-shed (turned off) for extended periods of time. The DCS system has only recently become able to monitor the loading of S2/S2A. Again, further analysis is necessary to determine S2/S2A have sufficient capacity to serve the anticipated additional loads for the digester and DAFT upgrades.

3.2.4 Summary of Load Change Effects on WPCP Electrical System

Implementation of the equipment changes discussed above and process operations discussed in other TMs are anticipated to result in an increase in the amount of power that must be delivered by the plant electrical power distribution system. A net increase of approximately 505KVA is expected for Phase 1 of the digester upgrade and 1595KVA if all digesters are upgraded. The load will be distributed among several parts (480V switchgears) of the power system. Table A-1 located in Attachment A provides a detailed breakdown of existing, removed, and new power. Table 3-2 provides a brief summary of anticipated power system loading changes for digester and DAFT system improvements.

Phase 1 Upgrade: For Phase 1 of the Digester and DAFT upgrade, the load changes will be distributed among existing MCC-G2 and new MCCs G3 and G4. This is expected to result in a running load increase of approximately 505KVA to the power system. With other equipment not identified yet (lights, RIO, electrical room HVAC, etc., the net increase in peak load is likely to be closer to the range of 525 - 550KVA.

Table 3-2. Summary of Digester Area MCC Capacity and Recommendations[1]

MCC	Year Installed	Rated Amps	Digesters Served	Estimated Connected Load (A)			Estimated Running Load (A)			Comments
				Now	Future	Change	Now	Future	Change	
B	1955	800	1 to 4	1023	1479	456	845	1190	345	Replace now because of its age with 1600A MCC, split bus with Tie CB.
G1	2005	1200	All (Gas)	1093	1093	0	790	790	0	No changes necessary for digester/DAFT Improvement Projects.
G2	2005	1200	*All* (Solids)	1649	1761	112	1138	947	-191	Modify as required to serve new Solids Control Building Loads
V	1983	3300[2]	9 to 11	348	741	393	280	641	361	Replace when digesters are rehabilitated because of insufficient capacity
Y1	1983	800	12 to 14	395	851	456	280	652	372	Replace when digesters are rehabilitated because of insufficient capacity
Y2	1983	800	15 to 16	424	683	259	337	569	232	Upgrade as required when digesters are rehabilitated
G3, G4[3]			5 to 8	-	849	849	-	795	795	New MCCs for Digester 5 to 8 Equipment.
Dig 5 to 8 & DAFT Totals (G1, G2, G3,G4)[2]			5 to 8 DAFT	2742	3703	961	1928	2532	604	Minimum estimated increase of 505KVA running power resulting in 2110KVA load
Remaining Digesters[2] B, V, Y1, Y2			1 to 4 9 to16	2190	3754	1564	1742	3052	1310	Minimum estimated increase of 1092KVA running power resulting in 2543KVA load on power system[4]
Totals All Digesters[4]			1 to 16	4932	7457	2525	3670	5584	1914	Minimum estimated increase of 1595KVA running power resulting in 6701KVA load on power system[4]

[1] *Load estimates are for major process 480V equipment only and do not include lighting upgrades, auxiliary equipment for building support for new electrical equipment, or new 120V equipment including instruments.*

[2] *Power to MCC-V is limited by feeder ratings of 300A and 350A from switchgear.*

[3] *MCC-G3 and MCC-G4 are new MCCs to serve equipment for upgrade of Digesters 5 to 8.*

[4] *MCC-G1 loads are mostly associated with gas storage system. G1 loading of Switchgears S2 and S2A must be considered in choosing power source for MCC's G3 and G4. Subtract 658KVA from estimated peak loading if equipment connected to MCC-G1 can be shed for an extended period of time while Switchgear S2 or S2A or their associated transformers are out of service. S2/2A also feed MCC-M. Add an estimated 100KVA (based upon MCC-M design drawings) to consider loading of switchgear S2/S2A.*

4. RECOMMENDATIONS

The preliminary recommendations for the digester and DAFT electrical systems are listed below. During the 10-percent design phase, the electrical system should be evaluated in further detail to determine if MCCs and their associated equipment should be replaced now or in the future when their associated digesters are upgraded.

4.1 Phase 1: Digester 5 to 8/DAFT/Solids Handling Upgrade

MCC-G2: Modify as necessary to accommodate changes for Phase 1. If space becomes an issue, locate additional MCC sections nearby, remote from main MCC. If space for remote sections cannot be found in

Solids Handling Building/DAFT area, locate some motor controllers in new MCCs G3/G4 for Digesters 5 to 8.

MCCs-G3/4: Locate new MCCs G3 and G4 between the power source and Digester 5 through 8 equipment. Preliminary study indicates that Switchgear S2 and S2A may have sufficient capacity to supply them, but this needs to be confirmed. Locations north or east of digesters appear best if sourced by S2/S2A. A feeder from Switchgear S7 could provide a backup power source, but may not have sufficient capacity. If other power sources other than S2/S2A are used, locate MCCs closer to switchgear to be used as a 480V power source.

480V Service Switchgear: Confirm 480V switchgears S2 and S2A have sufficient reserve capacity to supply loads connected to new MCCs (G3/G4), MCCs G1/G2, and other existing loads. If deemed to have insufficient capacity, consider other existing switchgear (S7, S13) power sources. If none have sufficient reserve capacity, install new 480V transformer(s) and switchgear as required to serve MCCs G3/G4.

Remote I/O: Install a RIO next to new MCCs to provide for control and monitoring of the new equipment by the DCS system. The RIO can be connected to the DCS in the Solids Contact Building or other nearby DCS computer. Use of fiber-optic cable to connect RIO will reduce likelihood of interference in DCS communications and will allow the communication cable to be routed in the same duct bank as power/control wires. Cable should not be spliced between RIO and DCS. Conventional copper communication wire may be used as an alternative to fiber-optic cable and may be more cost effective if existing spare instrumentation signal conduits are available and if its use eliminates need for fiber-optic signal conversion equipment. Copper cable may ultimately be more reliable if it eliminates need for fiber-optic signal conversion equipment.

Electrical Building: Consider providing a new building for new electrical equipment. This would reduce the need for maintenance and extend the life of electrical equipment.

4.2 Future Digester Upgrade Projects

MCC-B: Replace MCC B with a new MCC with split bus and tie breaker arrangement. Connect directly to 480V switchgear with redundant feeders. Bus rating should be large enough to accommodate future anticipated loads (1600A).

MCC-V: MCC-V will need to be expanded when Digesters 9 to 11 are upgraded. Replace it as part of Digester 9 to 11 upgrade project.

MCC-Y1: MCC-Y1 will need to be expanded when Digesters 12 to l4 are upgraded. Replace it as part of Digester 12 to 14 upgrade project.

MCC-Y2: MCC-Y2 will need to be expanded when Digesters 15 to l6 are upgraded. Replace it as part of Digester 15 to 16 upgrade project.

Electrical Building: The existing electrical building that houses MCC's V, Y1, and Y2 will need to be expanded when Digesters 9 to l6 are upgraded. Alternatively, consider whether a new building is a better solution to house part or all of the expanded (replacement) MCCs when the expansion occurs.

4.3 MCCs and Associated Electrical Equipment (All Projects)

Lighting Transformers and Panelboards: Though not evaluated in the field for this study, it appears panelboards and small distribution transformers for distribution of 120VAC power to small electrical loads have been identified for replacement by previous studies. Evaluate them during design when the associated MCCs that supply them are replaced. Replace then if deemed necessary.

Motor Power and Control Wiring: Replace power and control cables when power source to them is replaced or when the equipment itself is replaced.

Instrument and Controls:

- Replace control stations using corrosion resistant enclosures when power and control wire are replaced. Individual control stations that have enclosure failures should be replaced on an as-needed basis.
- Replace copper control wiring (Switches RP1 and RP2 to S800 Remote I/O).
- Replace control and instrumentation wiring when the equipment it connects is replaced.

Lighting: Replace/upgrade lighting when the associated equipment in an area is upgraded.

- Improve lighting throughout digester facilities
- Lighting (and other outdoor equipment) equipment should be corrosion resistant.

Maintenance Program: Electrical equipment service life can be extended by a scheduled maintenance program. Confirm maintenance is scheduled at regular intervals for the electrical power distribution system equipment including:

- Switchgear
- Switchboards
- Transformers (Substation, unit substation, and pad mount type)
- Motor Control Centers
- Panelboards
- Lighting transformers.

5. REFERENCES

CH2M- Hill, May 2007, San Jose – Santa Clara WPCP Infrastructure Condition Assessment Report.

City of San Jose, 2009. Existing On-Line Operations Manual.

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ATTACHMENT A: TABLE A-1

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Table A-1
San Jose WPCP
Digester Electrical Evaluation

DIGESTER	EQUIPMENT	Existing Major Equipment to Remain, HP	Existing Major Equipment Removed, HP	New Major Equipment, HP	MCC	BUS AMPS	MCC MFR DATE	FED FROM
1	Slug. Rec Pmp		20	30	B	600?	1955*	MCC A
1	Sec Heat Water Circ pmp 1	1.5			B	600?	1955*	MCC A
1	Dig Circ Compressor		30		G-2	1000	~1961**	S-2
1	Sludge Recirc Pump			30	G-2			
1	Digester Sludge Feed Pump 1			20	G-2			
1	Gas Compressor 1			25	G-2			
1	Gas Compressor 2			25	G-2			
2	Dig Gas Circ Compressor		15		G-2	1000	~1961**	S-2
2	Slug. Rec Pmp		20		B	600?	1955*	MCC A
2	Sec Heat Water Circ pmp 2	1.5			B	600?	1955*	MCC A
2	Sludge Recirc Pump			30	G-2			
2	Digester Sludge Feed Pump 1			20	G-2			
2	Gas Compressor 1			25	G-2			
2	Gas Compressor 2			25	G-2			
3	Slug. Rec Pmp		20		B	600?	1955*	MCC A
3	Sec Heat Water Circ pmp 3	1.5			B	600?	1955*	MCC A
3	Dig Gas Circ Compressor		15		G-2	1000	~1961**	S-2
3	Dig Circ Pump	30			G-2	1000	~1961**	S-2
3	Sludge Recirc Pump			30	G-2			
3	Digester Sludge Feed Pump 1			20	G-2			
3	Gas Compressor 1			25	G-2			
3	Gas Compressor 2			25	G-2			
4	Sec Heat Water Circ pmp 4	1.5			G-2	1000	~1961**	S-2
4	Gas Circ Compressor		15		G-2	1000	~1961**	S-2
4	Circ Pump		30		G-2	1000	~1961**	S-2
4	Sludge Recirc Pump			40	G-2			
4	Digester Sludge Feed Pump 1			20	G-2			
4	Gas Compressor 1			40	G-2			
4	Gas Compressor 2			40	G-2			
5	Sec Heat Water Circ pmp 5	1.5			G-2	1000	~1961**	S-2
5	Dig Gas Circ Compressor		15		G-2	1000	~1961**	S-2
5	Dig Circ Pump		30		G-2	1000	~1961**	S-2
5	Sludge Recirc Pump			40	G-2			
5	Digester Sludge Feed Pump 1			20	G-2			

Table A-1
San Jose WPCP
Digester Electrical Evaluation

DIGESTER	EQUIPMENT	Existing Major Equipment to Remain, HP	Existing Major Equipment Removed, HP	New Major Equipment, HP	MCC	BUS AMPS	MCC MFR DATE	FED FROM
5	Gas Compressor 1			40	G-2			
5	Gas Compressor 2			40	G-2			
6	Sec Heat Water Circ pmp 6	1.5			G-2	1000	~1961**	S-2
6	Dig Gas Circ Compressor		15		G-2	1000	~1961**	S-2
6	Dig Circ Pump		30		G-2	1000	~1961**	S-2
6	Sludge Recirc Pump			40	G-2			
6	Digester Sludge Feed Pump 1			20	G-2			
6	Gas Compressor 1			40	G-2			
6	Gas Compressor 2			40	G-2			
7	Sec Heat Water Circ pmp 7	1.5			G-2	1000	~1961**	S-2
7	Dig Gas Circ Compressor		15		G-2	1000	~1961**	S-2
7	Dig Circ Pump		30		G-2	1000	~1961**	S-2
7	Sludge Recirc Pump			40	G-2			
7	Digester Sludge Feed Pump 1			20	G-2			
7	Draft tube mixer 1			25	G-2			
7	Draft tube mixer 2			25	G-2			
7	Draft tube mixer 3			25	G-2			
7	Draft tube mixer 4			25	G-2			
8	Sec Heat Water Circ pmp 8	1.5			G-2	1000	~1961**	S-2
8	Dig Gas Circ Compressor		15		G-2	1000	~1961**	S-2
8	Dig Circ Pump		30		G-2	1000	~1961**	S-2
8	Sludge Recirc Pump			40	G-2			
8	Digester Sludge Feed Pump 1			20	G-2			
8	Focus flow mixer 1			20	G-2			
8	Focus flow mixer 2			20	G-2			
8	Focus flow mixer 4			20	G-2			
8	Focus flow mixer 4			20	G-2			
8	Focus flow mixer 5			20	G-2			
9	Sec Heat Water Circ pmp 9	1.5			V	600	~1983	S-13
9	Dig Gas Circ Compressor		15		V	600	~1983	S-13
9	Dig Circ Pump		30		V	600	~1983	S-13
9	Sludge Recirc Pump			40	V			
9	Digester Sludge Feed Pump 1			20	V			
9	Gas Compressor 1			40	V			
9	Gas Compressor 2			40	V			

Table A-1
San Jose WPCP
Digester Electrical Evaluation

DIGESTER	EQUIPMENT	Existing Major Equipment to Remain, HP	Existing Major Equipment Removed, HP	New Major Equipment, HP	MCC	BUS AMPS	MCC MFR DATE	FED FROM
10	Sec Heat Water Circ pmp 10	1.5			V	600	~1983	S-13
10	Dig Gas Circ Compressor		15		V	600	~1983	S-13
10	Dig Circ Pump		30		V	600	~1983	S-13
10	Sludge Recirc Pump			40	V			
10	Digester Sludge Feed Pump 1			20	V			
10	Gas Compressor 1			40	V			
10	Gas Compressor 2			40	V			
11	Sec Heat Water Circ pmp 11	1.5			V	600	~1983	S-13
11	Dig Gas Circ Compressor		15		V	600	~1983	S-13
11	Dig Circ Pump		30		V	600	~1983	S-13
11	Sludge Recirc Pump			40	V			
11	Digester Sludge Feed Pump 1			20	V			
11	Gas Compressor 1			40	V			
11	Gas Compressor 2			40	V			
12	Slug. Rec Pmp	20			Y-1	800	~1983	S-13-1
12	Gas Compressor		30		Y-1	800	~1983	S-13-1
12	Sec Heat Water Circ pmp 12		1.5		Y-1	800	~1983	S-13-1
12	Sludge Recirc Pump			40	Y-1			
12	Digester Sludge Feed Pump 1			20	Y-1			
12	Gas Compressor 1			40	Y-1			
12	Gas Compressor 2			40	Y-1			
13	Slug. Rec Pmp		20		Y-1	800	~1983	S-13-1
13	Gas Compressor		30		Y-1	800	~1983	S-13-1
13	Sec Heat Water Circ pmp 13	1.5			Y-1	800	~1983	S-13-1
13	Sludge Recirc Pump			40	Y-1			
13	Digester Sludge Feed Pump 1			20	Y-1			
13	Gas Compressor 1			40	Y-1			
13	Gas Compressor 2			40	Y-1			
14	Slug. Rec Pmp		20		Y-1	800	~1983	S-13-1
14	Gas Compressor		30		Y-1	800	~1983	S-13-1
14	Slge Tfr pmp 1	20			Y-1	800	~1983	S-13-1
14	Slge Tfr Pmp 2	20			Y-1	800	~1983	S-13-1
14	Sec Heat Water Circ pmp 14	1.5			Y-1	800	~1983	S-13-1
14	Sludge Recirc Pump			40	Y-1			

Table A-1
San Jose WPCP
Digester Electrical Evaluation

DIGESTER	EQUIPMENT	Existing Major Equipment to Remain, HP	Existing Major Equipment Removed, HP	New Major Equipment, HP	MCC	BUS AMPS	MCC MFR DATE	FED FROM
14	**Digester Sludge Feed Pump 1**			**20**	Y-1			
14	**Gas Compressor 1**			**40**	Y-1			
14	**Gas Compressor 2**			**40**	Y-1			
15	Sec Heat Water Circ pmp 15	1.5			Y-2	800	~1983	S-13-2
15	**Gas Compressor**		**30**		Y-2	800	~1983	S-13-2
15	**Slug. Rec Pmp**		**20**		Y-2	800	~1983	S-13-2
15	**Sludge Recirc Pump**			**40**	Y-2			
15	**Digester Sludge Feed Pump 1**			**20**	Y-2			
15	**Gas Compressor 1**			**40**	Y-2			
15	**Gas Compressor 2**			**40**	Y-2			
16	Sec Heat Water Circ pmp 16	1.5			Y-2	800	~1983	S-13-2
16	**Gas Compressor**		**30**		Y-2	800	~1983	S-13-2
16	**Slug. Rec Pmp**		**20**		Y-2	800	~1983	S-13-2
16	**Sludge Recirc Pump**			**40**	Y-2			
16	**Digester Sludge Feed Pump 1**			**20**	Y-2			
16	**Gas Compressor 1**			**40**	Y-2			
16	**Gas Compressor 2**			**40**	Y-2			
STDBY	**Digester Sludge Feed Pump 1 to 3**			**20**	G-2			
STDBY	**Digester Sludge Feed Pump 4 to 11**			**20**	G-2			
STDBY	**Digester Sludge Feed Pump 4 to 11**			**20**	G-2			
STDBY	**Digester Sludge Feed Pump 4 to 11**			**20**	G-2			
STDBY	**Digester Sludge Feed Pump 4 to 11**			**20**	G-2			
STDBY	**Digester Sludge Feed Pump 12 to 16**			**20**	Y-1			
STDBY	**Digester Sludge Feed Pump 12 to 16**			**20**	Y-1			
COM	Slge Tfr Pmp 1 Dig1-4 (4-1)	20			B	600?	1955*	MCC A
COM	Slge Tfr Pmp 2 Dig1-4 (4-2)	20			B	600?	1955*	MCC A
STDBY	Sec Heat Water Circ pmp	1.5			G-2	1000	~1961**	S-2
TUNNEL	Sump pump 1	5			Y-1	800	~1983	S-13-1
COM	Transformer 21LA 15KVA				Y-1	800	~1983	S-13-1
COM	Slge Tfr pmp 15-16	20			Y-2	800	~1983	S-13-2
TUNNEL	Sump pump 2	5			Y-2	800	~1983	S-13-2
TUNNEL	Exhaust Fan	0.75			Y-2	800	~1983	S-13-2
STDBY	Stdby Dig Circ	60			G-2	1000	~1961**	S-2
COM	Control Rm Ex Fan 3	1			G-2	1000	~1961**	S-2

Table A-1
San Jose WPCP
Digester Electrical Evaluation

DIGESTER	EQUIPMENT	Existing Major Equipment to Remain, HP	Existing Major Equipment Removed, HP	New Major Equipment, HP	MCC	BUS AMPS	MCC MFR DATE	FED FROM
COM	Control Rm Ex Fan 5	1			G-2	1000	~1961**	S-2
COM	Control Rm Ex Fan 4	2			G-2	1000	~1961**	S-2
COM	Control Rm Ex Fan 6	1			G-2	1000	~1961**	S-2
COM	Tunnel Ex Fan 7	1			G-2	1000	~1961**	S-2
COM	Duplex Sump Pmp A	7.5			G-2	1000	~1961**	S-2
COM	Duplex Sump Pmp B	7.5			G-2	1000	~1961**	S-2
COM	Digester Liquor Pmp	20			G-2	1000	~1961**	S-2
COM	Service Station Feeder				G-2	1000	~1961**	S-2
COM	Lighting Panel L-26				G-2	1000	~1961**	S-2
COM	Number 2 Water Circ Pmp 1	0.75			G-2	1000	~1961**	S-2
COM	Number 2 Water Circ Pmp 2	0.75			G-2	1000	~1961**	S-2
COM	Street Lighting				G-2	1000	~1961**	S-2
COM	Slge Tfr Pmp 3 Dig1-4 (4-3)	20			B	600?	1955*	MCC A
COM	Slge Tfr Pump 20-1	20			G-2	1000	~1961**	S-2
COM	Slge Tfr Pump 20-2	20			G-2	1000	~1961**	S-2
COM	Slge Tfr Pump 20-3	20			G-2	1000	~1961**	S-2
COM	Pressurized Flow Pump 1	100			G-1	1350	~1961**	S-2
COM	Pressurized Flow Pump 2	200			G-1	1350	~1961**	S-2
COM	Gas Compressor 1	250			G-1	1350	~1961**	S-2
COM	Gas Compressor 2	250			G-1	1350	~1961**	S-2
COM	Gas Compressor 3	250			G-1	1350	~1961**	S-2
COM	Concent. Sldg Pmp 1	30			G-2	1000	~1961**	S-2
COM	Concent. Sldg Pmp 3	30			G-2	1000	~1961**	S-2
COM	Concent. Sldg Pmp 1	15			G-2	1000	~1961**	S-2
COM	Concent. Sldg Pmp 2	15			G-2	1000	~1961**	S-2
COM	Concent. Sldg Pmp 3	15			G-2	1000	~1961**	S-2
COM	Concent. Sldg Pmp 4	15			G-2	1000	~1961**	S-2
COM	Drainage Pmp 1	20			G-2	1000	~1961**	S-2
COM	Bot. Screw Con Drive 1	1.5			G-2	1000	~1961**	S-2
COM	Bot. Screw Con Drive 2	1.5			G-2	1000	~1961**	S-2
COM	Bot. Screw Con Drive 3	1.5			G-2	1000	~1961**	S-2
COM	Bot. Screw Con Drive 4	1.5			G-2	1000	~1961**	S-2
COM	Bot. Screw Con Drive 5	1.5			G-2	1000	~1961**	S-2
COM	Bot. Screw Con Drive 6	1.5			G-2	1000	~1961**	S-2
COM	Sludge Col Drive 1	0.5			G-2	1000	~1961**	S-2

Table A-1
San Jose WPCP
Digester Electrical Evaluation

DIGESTER	EQUIPMENT	Existing Major Equipment to Remain, HP	Existing Major Equipment Removed, HP	New Major Equipment, HP	MCC	BUS AMPS	MCC MFR DATE	FED FROM
COM	Sludge Col Drive 2	0.5			G-2	1000	~1961**	S-2
COM	Sludge Col Drive 3	0.5			G-2	1000	~1961**	S-2
COM	Sludge Col Drive 4	0.5			G-2	1000	~1961**	S-2
COM	Sludge Col Drive 5	0.5			G-2	1000	~1961**	S-2
COM	Sludge Col Drive 6	0.5			G-2	1000	~1961**	S-2
COM	Conc. Sludge Skim Drive 1	3			G-2	1000	~1961**	S-2
COM	Conc. Sludge Skim Drive 2	3			G-2	1000	~1961**	S-2
COM	Conc. Sludge Skim Drive 3	3			G-2	1000	~1961**	S-2
COM	Conc. Sludge Skim Drive 4	3			G-2	1000	~1961**	S-2
COM	Conc. Sludge Skim Drive 5	3			G-2	1000	~1961**	S-2
COM	Conc. Sludge Skim Drive 6	3			G-2	1000	~1961**	S-2
COM	Conc. Sludge Screw Con Drive 1	3			G-2	1000	~1961**	S-2
COM	Conc. Sludge Screw Con Drive 2	3			G-2	1000	~1961**	S-2
COM	Conc. Sludge Screw Con Drive 3	3			G-2	1000	~1961**	S-2
COM	Conc. Sludge Screw Con Drive 4	3			G-2	1000	~1961**	S-2
COM	Drainage Pmp 2	20			G-2	1000	~1961**	S-2
COM	Comp Cooling Water Circ Pmp	5			G-2	1000	~1961**	S-2
COM	Comp Room Ex Fan 1	1			G-2	1000	~1961**	S-2
COM	Comp Room Ex Fan 2	1			G-2	1000	~1961**	S-2
	Total	1626.25	711.5	2330				

* MCC is obsolete - Plan for replacement if possible

** MCC originally constructed in 1961 and updated in the 1980s

1961 Drawings
1983 Drawing 21E301
1983 Drawing 21E302
1966 Drawing Sheet 21
1985 Drawing 21E301