STATE OF CALIFORNIA

DEPARTMENT OF GENERAL SERVICES

Project Management Branch, Real Estate Services Division

Department of Corrections & Rehabilitation

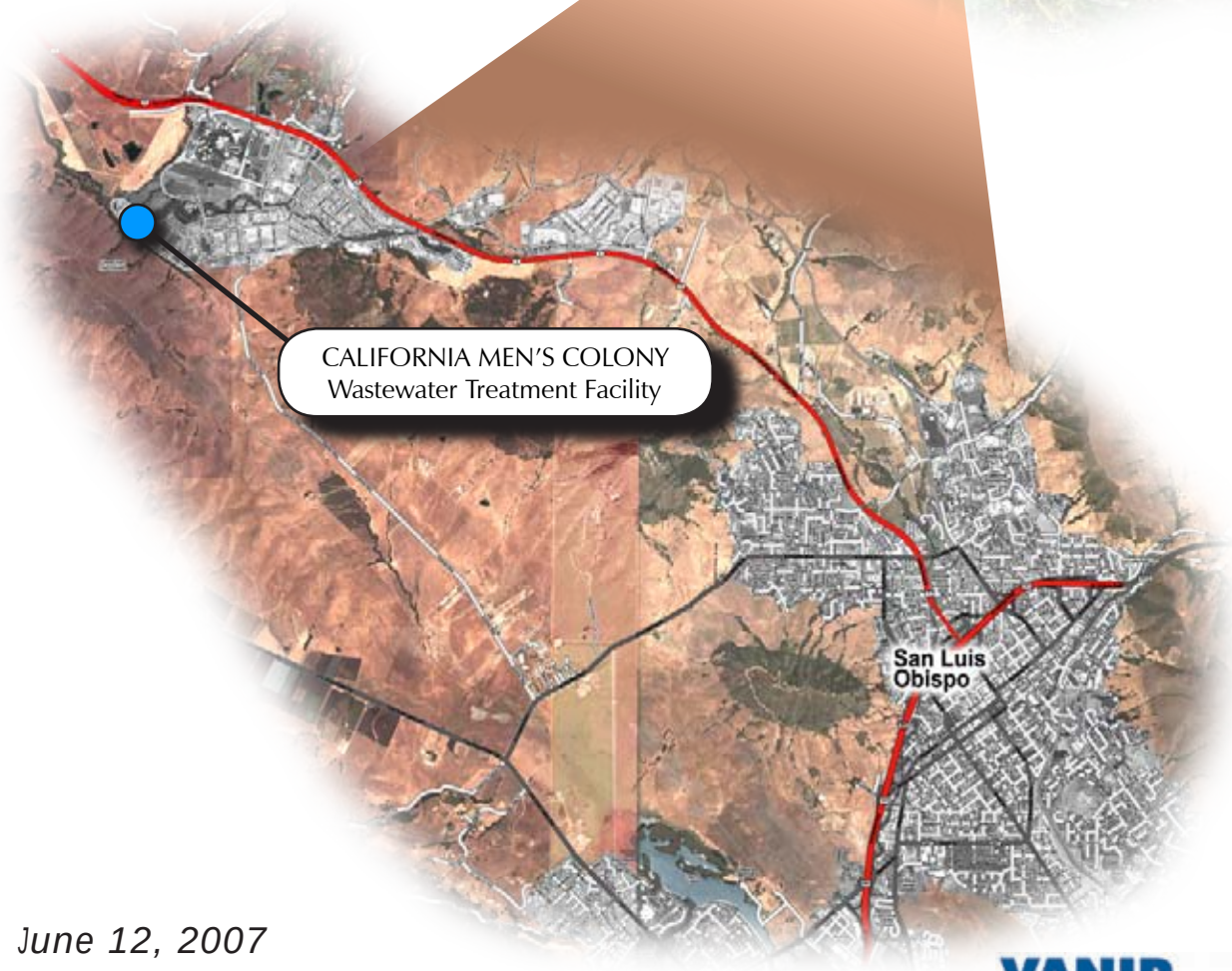
California Men's Colony

Wastewater Collection Treatment Upgrade

Startup Plan

BOOK 1

Startup & Testing Process



June 12, 2007

VANIR

VANIR CONSTRUCTION MANAGEMENT, INC.

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Section 1.0 Executive Summary

1.0 Introduction

A successful commercial operation requires a successful startup. To achieve a successful project, there must be a plan for a successful startup. There is a strong correlation between startup success and the extent of startup planning. Comprehensive startup planning affords the opportunity to shorten the startup period, reduce startup costs and begin operations. Information and knowledge gained from past experience should be used to improve future startups.

Poor communications, lack of information, or lack of resources are potential obstacles that can create unnecessary problems during startup. Everyone involved in the startup planning should make a special effort to be deliberate and focused to reduce problems that impact the startup and function testing of the facility.

Proper and thorough implementation of this startup plan will significantly increase the likelihood of startup success. Some of the planning activities are more important than others. These activities are.

- All startup team members must understand the complete scope of work prior to commencement of startup.
- The startup teams must update the startup plan as needed, and communicate this to all team members as soon as possible.
- The operating entity must be involved early, and updated with operating organization and management plans.
- The startup team must perform checkout of the equipment and automated controls following the prepared startup plan, thus avoiding last minute problems and delays.
- Commission the new treatment system on time.
- Finalize the startup documentation to facilitate project closeout.

1.1 Startup Plan

This report is organized into three books. Book 1 describes the overall general startup process for the facility which includes: the general startup scope, safety & startup objectives, startup milestones, planning activities, startup team, training program, and the actual Functional Testing & Startup Outline.

Book 1

Section -2- Scope of Startup identifies system startup purpose, overall responsibilities, and items of special interest.

Section -3- Safety Objectives The safety objectives identify the importance of safety and the General Contractor's overall responsibility for safety during construction, which includes startup.

Section -4- Startup Objectives The startup objectives identify the issues and activities that are key to a successful startup.

Section -5- Roles of Key Startup Team Personnel. This section identifies the elements of the project team, their roles / responsibilities, and the relationships between personnel.

Section -6- Startup Planning Activities describes the general step-by-step process for startup which includes:

Pre-Startup

Prior to conducting the startup process the following items must be completed:

- Finalize the Operations and Maintenance Organization and Management Systems
- Complete Startup & Functional/Operation Testing Plan for Review
- Complete Operator Training Plan for Review

Performance Testing

This stage in the process involves testing equipment for proper performance at point of manufacture or assembly when specified.

General Startup & Testing

Procedures for startup & testing of:

- Mechanical Systems
- Electrical Systems
- Instrumentation Systems

Functional Testing

Functionally tests mechanical and electrical equipment, and instrumentation and control systems for proper operation after general start-up and testing task have been completed. Functional testing is a plantwide testing & operation procedure under full load conditions, using water only.

Operator Training

See Section 8 - Training Program

Operational Testing

Operational testing demonstrates satisfactory operation of equipment and systems in actual operation. The entire facility is operated using untreated influent.

Project Close-out Procedures

All project documentation should be finalized and submitted prior to the departure of project personnel.

Section -7- Startup Milestones lists the key milestone activities and planned dates as they relate to the startup process.

Section -8- Actual Functional Testing & Startup Outline is the sequencing of events submitted by the General Contractor on September 26, 2006.

Section -9- Training Program details a multi-phased training process which includes on-the-job and specialized training components to be performed by the equipment vendors, prior to the completion of plant startup.

Section -10- Contact List provides the names, titles, and contact information for key personnel associated with the design, construction, startup, and operation of the CMC, Waste Water Treatment Facility Upgrade.

Book 2

Book 2 of this report details the actual startup and shutdown procedures for the California Men's Colony — Wastewater Collection Treatment Upgrade. It has been written with the assumption that all safety interlocks are functional, and the process and equipment are operating by the automatic control system. The procedures are organized into two separate focuses as follows:

- Mechanical Startup
- Electrical Startup
- Instrumentation Startup

These procedures are based upon normal conditions and circumstances. They should be used knowing that extraordinary conditions and circumstances may require modifications of the steps for personnel safety and to ensure that equipment damage or process upsets do not occur. Operators should be trained in plant safety (*see Book 1 - Section 9.0 of this report*). When in doubt about the appropriateness of procedures, an operator should consult with the supervisor(s) and/or manufacturer's Operations & Maintenance Manual.

This section also describes alarm conditions that can occur during operation of the major equipment and processes at the plant. The alarms are provided for operational surveillance of the equipment and processes, alerting operators to possible problems. Even though alarms will occasionally clear by themselves, in the automatic control system, an operator should always investigate the reason why an alarm sounded. Each alarm heading is followed by a statement, which describes where the alarm is indicated along with the suggested correction actions.

The Startup Plan presented herein was developed specifically for use at the California Men's Colony Waste Water Collection Treatment Upgrade located in San Luis Obispo, California

Book 3

Book three - Appendix "B" - contains all of the completed mechanical and electrical sign-off sheets/checklists and other pertinent information, data, and documentation of the CMC WWTF startup & functional testing.

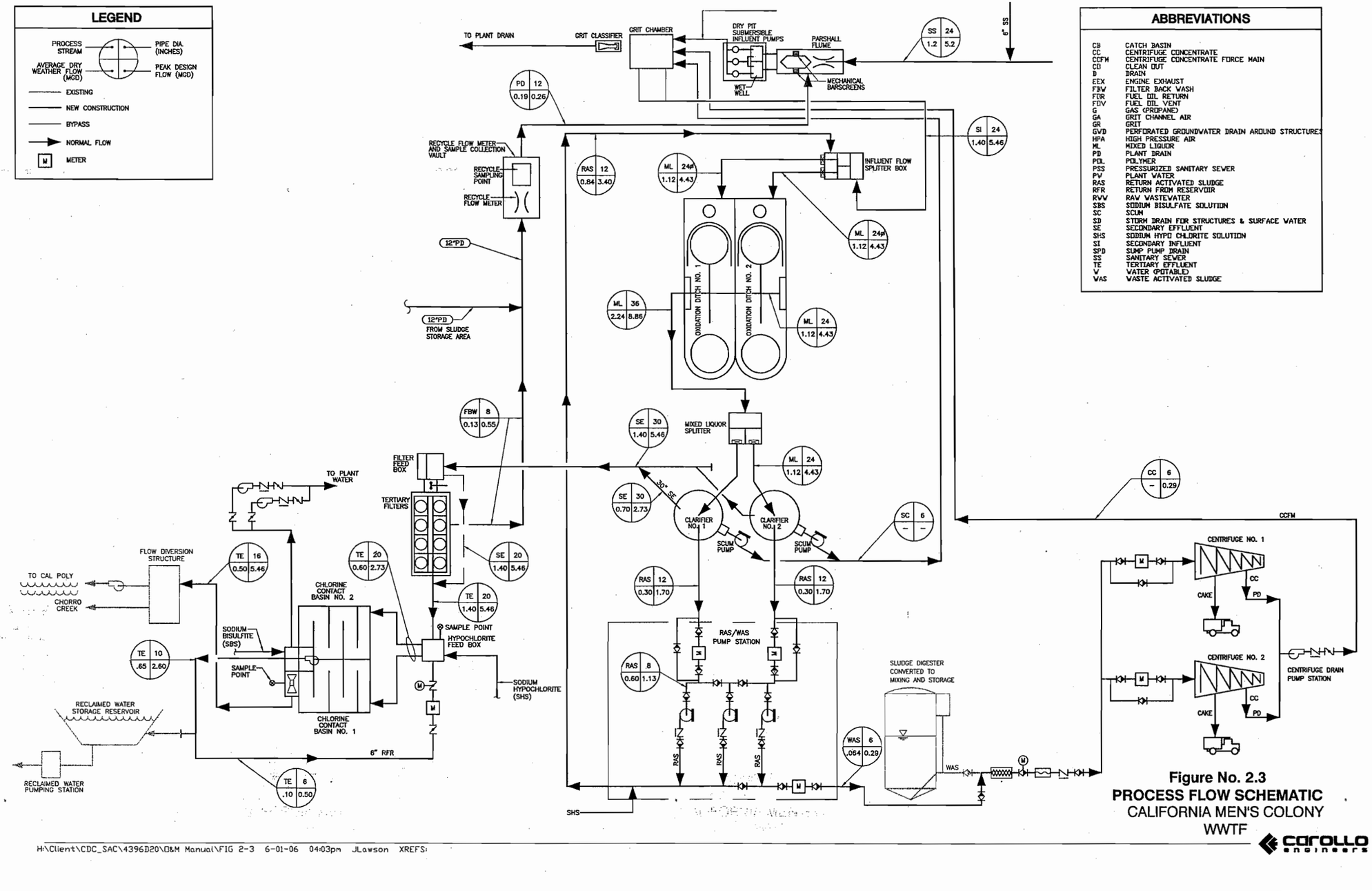
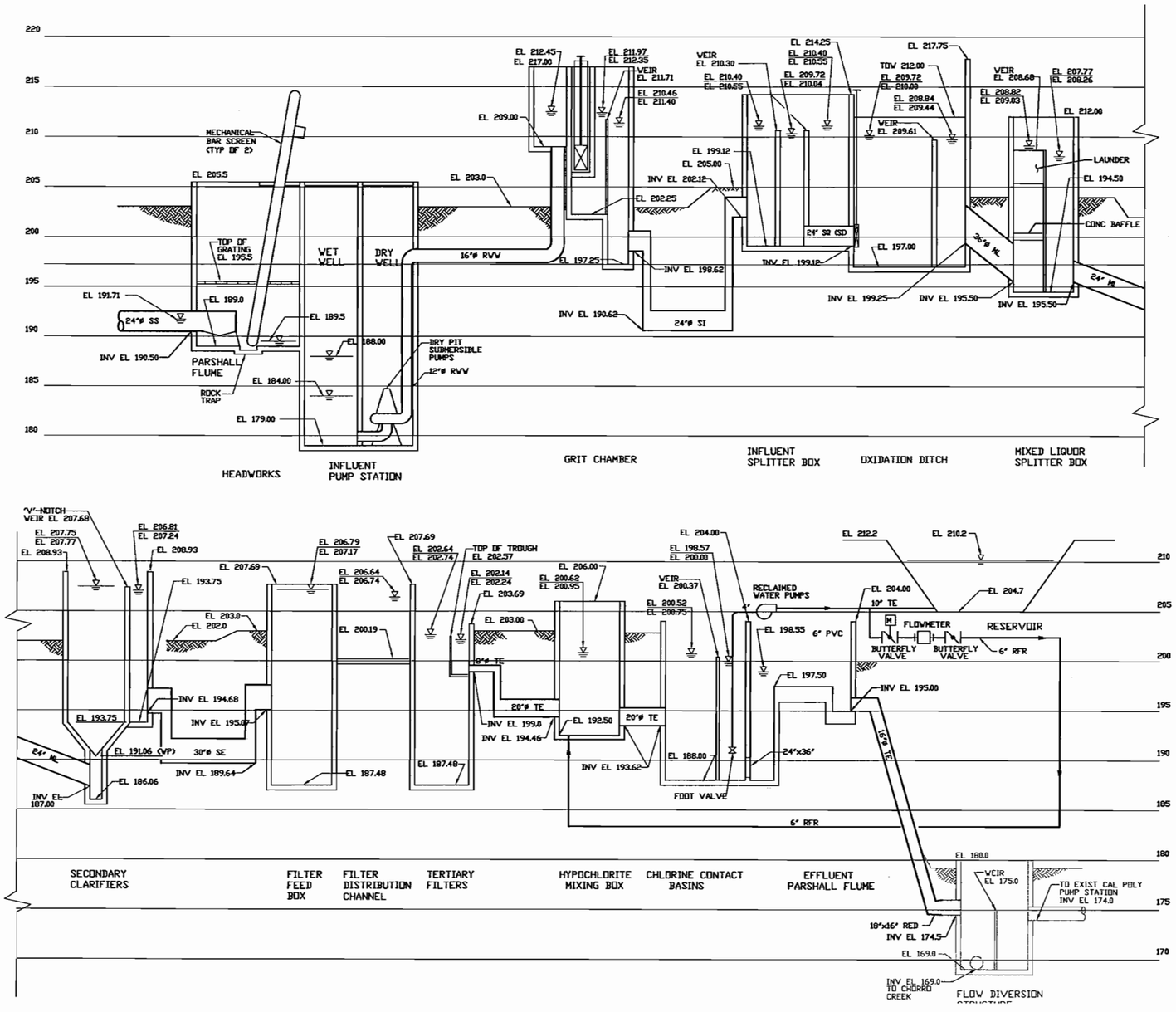


Figure No. 2.3
PROCESS FLOW SCHEMATIC
CALIFORNIA MEN'S COLONY
WWTF



NOTE:

1. WATER SURFACE ELEVATION AT ADWF 1.2 MGD/WATER SURFACE ELEVATION AT AT PHWWF 5.2 MGD.

Figure No. 2.4
HYDRAULIC PROFILE OF THE LIQUID TREATMENT PROCESS
CALIFORNIA MEN'S COLONY
WWTF

H:\Client\CDC_SAC\4396D20\O&M Manual\FIG 2-4 6-01-06 04:07pm JLawson XREFS:

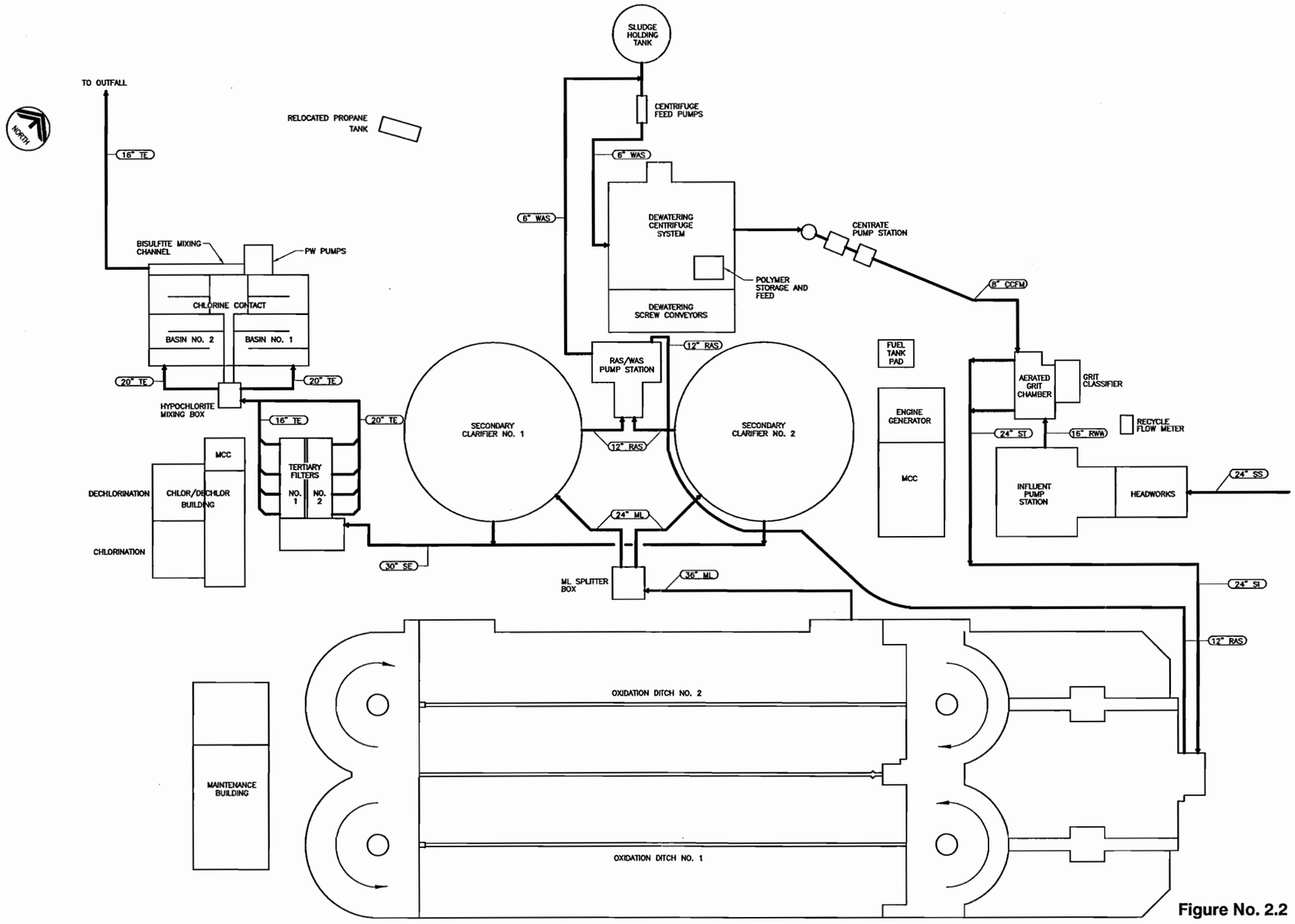


Figure No. 2.2
WASTEWATER TREATMENT FACILITY
PROCESS FLOW LAYOUT
CALIFORNIA MEN'S COLONY
WWTF

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Section 2.0 Scope of Startup

For Vanir purposes, a plant or treatment system startup is defined as the work conducted during the period of time from completion of plant construction to the beginning of commercial operations. This includes all of the activities that bridge these two phases, such as, process control debugging, mechanical equipment checkout, operator training, commissioning of the system, seeding, introduction of process water and performance testing.

- The General Contractor (GC) will have primary startup responsibility.
- Startup is based on the wastewater system startup taking approximately eight man-weeks.
- A full time Construction Manager from Vanir CM will oversee the construction for the duration of the project.
- The GC and his/her instrumentation sub-contractor will provide all instrumentation, control hardware, and control logic. The instrumentation sub-contractor will have total integration responsibility for the process control system.
- Equipment vendors will provide: Pre-startup inspections and on-site detailed Operations & Maintenance Manuals for all of the provided equipment they represent.
- Equipment vendors will provide: Depending on the vendor, approximately 2 man-weeks of on-site 'Formal Type' Operator Training for the wastewater treatment system.
- The Design Engineer is responsible for preparing and providing the 'Standard Operating Procedures' (SOP).

Items of Special Interest.

- Headwork's: Supply container or dumpster for screenings & grit disposal
- Tertiary Filters: Contract with supplier for chemicals (e.g. polymer, PAC, Alum)
  Order chemicals for startup
- Chlor/Dechlor: Order chemicals for startup
- Dewatering: Order polymer for startup of centrifuge
  Contract supplier for polymer
  Acquire dump truck for hauling dewatered solids to storage area
  Contract for hauling dewatered solids for off-site disposal
- General: Review equipment O&M Manuals & order consumables (oil/grease)
  Relocate automatic samplers as required
  Install any safety equipment as required by CMC (Fire prevention)

Section 3.0 Safety Objectives

3.0 General Safety & Responsibilities

The General Contractor (GC) is required to ensure and maintain safety during construction, and shall be focused upon providing a workplace free from physical hazards, reducing opportunities for accidents, and improving the effectiveness of all employees. A plant startup is not successful if injury to human health or the environment is caused due to lack of focus on these principals. To that end, the GC shall ensure everyone on the startup staff has or is given proper training, is provided with / using the proper PPE (Personal Protection Equipment) at all times, and that they understand and accept personal responsibility for a safe workplace, facility, community, and the environment.

There are many potential hazards associated with the startup of a new treatment facility. Staying alert and always being aware of potentially dangerous situations are the greatest accident prevention practice an individual can employ.

A Site Specific Health and Safety Plan has been prepared for the Project by the GC for the CMC Wastewater Collection Treatment Plant Upgrade. Vanir CM, D.G.S., The Ryan Company, and Contra Costa Electrical will add additional safety requirements as needed and prudent.

For any safety related information, please refer to this document. All Management and/or Contractor personnel working on site are required and responsible for reading and complying with all site safety rules and regulations.

3.1 Plant Safety

The safety guidelines for each process and major pieces of equipment are not intended to supersede existing facility safety policies and procedures. When emergency, abnormal, or alarmed operating conditions occur, only fix the problem if it can be accomplished safely. If it is not possible to correct a problem safely with available equipment and immediate action is required to prevent an illegal discharge or to protect equipment, the operator should notify the Supervisor and obtain the necessary assistance and equipment to safely correct the problem. The established facility safety procedures should be observed during all operations, including operation under abnormal or emergency conditions.

Always lockout equipment before service or repair. Notify other operators of unit malfunctions and the people working to repair the problem. When equipment is returned to service, notify other operators, so all of the plant staff is up to date. Follow established safety procedures before and during the work. Always clean up spilled chemicals and lubricants to maintain a safe working environment. Fire extinguishers are located throughout the facility. Operators should be familiar with their location and use.
Sludge collection mechanisms and other slowly operating equipment operate with a lot of torque. Even though a piece of equipment operates slowly, do not perform a task that could cause you to get in the way of the equipment. Equipment can sneak up quietly and still cause painful injuries even though it does not rotate very fast.

Areas around treatment facility equipment have inherent hazards that arise from electricity, moving parts, certain chemicals, and housekeeping requirements. These safety instructions are provided as general guidelines only for operation of the facilities. They are not intended to supersede or supplant exist plant safety instructions and procedures. Some general safety precautions include:

- Almost all equipment at the facility is capable of remote control operation and may start at any time. Prior to servicing or inspection, all equipment controls should be stopped and locked out.
- Use caution during wash down of process areas. Do not hose down electrical motors or extension cords on the ground.
- Guards over moving equipment such as couplings or shafts are required and must be in place at all times.
- Wearing loose clothing, long hair, rings, and other jewelry around machinery should be avoided to prevent entanglement.
- When starting rotating equipment after shutdown, personnel should stay well away from rotating shafts because dust, oil, or loose metal may be thrown.
- Use caution when working with chemicals or other hazardous materials. Always wear personal protective equipment and avoid contact with skin.

3.1.1 Slip Hazards

There are a number of locations in a wastewater treatment plant where slip hazard can be a problem. Some of the chemicals used in the treatment process are slippery.
The nutrients in wastewater encourage the growth of slimes that are very difficult to walk on. Areas, where standing water accumulates, should be cleaned up to prevent slime growth. Spread grit to improve traction in low-lying areas. The walkways and grating around the oxidation ditch and secondary clarifiers may be wet. This may be caused by the moist environment and sprayers around the basins. Extra care should be taken to avoid injuries due to slipping. Walkways should always be kept clear.

Another possible slip hazard occurs after a foaming problem in the oxidation ditch. Foam is an excellent vehicle to transporting minute grease particles up to walking surfaces. The grease build up on walking surfaces is unsightly and a possible slip hazard. Clean the deck surface around the oxidation ditch with a deck brush to ensure the area is safe to walk.

3.1.2 Electrical Safety

The electrical switchgear should be off limits to all but qualified personnel to prevent anyone from making accidental contact. While work is being performed on any mechanical equipment, its power source should be locked out, and all safety procedures should be followed. All power tools should be adequately grounded to prevent shock. All electrically driven equipment having either remote or automatic controls should have signs attached stating that the equipment may start at any time. Only qualified personnel should perform electrical maintenance and repairs.

3.1.3 Safety Around Pumps

Areas around pumps have hazards that arise primarily from moving equipment and from housekeeping. Particular hazards are reciprocating equipment and rotating shafts. Guards over coupling and shafts must be in place at all times. The wearing of loose clothing, rings and other jewelry around machinery should be avoided; long hair and beards are considered potential hazards. When starting rotating equipment after a shutdown, personnel should stay well away from the rotating shafts. Dust and oil, or loose metal may be thrown from shafts and couplings.

Many pipes, including the pumped sludge lines, RAS, and WAS lines, are under pressure. Precautions should be taken to ensure that the equipment is isolated, and the pressure is released carefully before working on or disconnecting equipment or piping.

3.1.4 Confined Spaces

Confined spaces are locations in the plant that have limited access or are not designed for normal occupation. They may be tanks where engulfment is possible, or low spots where toxic gases may accumulate. Always use the required safety equipment to ensure the work environment is safe. The facility safety procedures and policies describe a confined space, the requirements for entry, and locations of some of the confined spaces in the facility.

Section 4.0 Startup Objectives

In general, the objectives of a successful startup are as follows:

- Verify all mechanical, electrical and control systems are installed and functioning correctly.
- Ensure full compliance with all local, State and Federal regulations where applicable.
- Ensure the safety and security of all on-site personnel at all times.

It is understood that there are certain startup activities, which are completed by subcontractors and verified by the startup team. These activities have been identified as follows.

- Hydrostatic testing of all pipes and tanks have been performed and documented by the Mechanical Contractor, verified, inspected and signed off by the appropriate authority.
- I/O loop checkout is complete and verified by the Electrical Contractor, verified, inspected and signed off by the appropriate authority.
- Cleaning/flushing of the pipelines have been completed by the Mechanical Contractor, verified, inspected and signed off by the appropriate authority.
- Providing electrical power is the responsibility of the General Contractor, verified, inspected and signed off by the appropriate authority.
- Meggaring and motor rotation is the responsibility of the Electrical Contractor, verified, inspected and signed off by the appropriate authority.
- Motor, pump and slide gate alignment is the responsibility of the Mechanical Contractor, verified, inspected and signed off by the appropriate authority.

Section 5.0 ROLES OF KEY STARTUP TEAM PERSONNEL

6.0 Team Personnel and Roles

Project Manager

- Manages the bidding, awards and construction phases of the project
- Plans and schedules project activities
- Coordinates all project phases, including startup
- Monitors and controls project costs
- Insures startup meets future operating needs
- Responsible for the details of QA/QC and their attainment

Project Process Engineer

- Responsible for designing a reliable process with applicable technologies that meet design criteria in a cost effective manner.
- Responsible for the treatment process through startup and initial operations.

Startup Manager

- Understands project startup requirements and forecasts startup costs
- Responsible for planning, scheduling, and implementing startup.
- Responsible for drafting the startup plan.
- Maintains active communications with the Project Manager throughout the project for updates and changes.
- Provides witnessing of the Factory Acceptance Testing (FAT)
- Provides Operations Specialists to coordinate and conducts the startup activities according to the Startup plan and startup schedule.
- Responsible for the scope of work, program, and documentation of Operator Training.

Procurement Manager

- Responsible for acquiring the necessary specialized equipment and services for the project, checks the supplier's qualifications, and or attain get the best quality at the lowest possible cost.

- Provides the suppliers with a specifically defined scope of service they are to provide during commissioning and startup.

Procurement Issues

Item No.	DATE	ITEM	DESCRIPTION
1		Emergency Generator	The delivery of the generator is delayed. Startup will begin before the generator arrives. However, the generator needs to be on site to run Acceptance Test.
2		Chemicals	Scope Issue. Who is required to purchase chemicals? Chemicals need to be on site when seeding begins.
3		Samplers	Samplers will be required shortly after we begin seeding. A local firm needs to be identified as a source for rentals.
4		Filter Bags	Scope Issue. Who is required to purchase Filter Bags? Filter Bags need to be on site when wet testing begins.
5		Generator Fuel	Scope Issue. Who is required to purchase Gen. Fuel? Fuel needs to be on site before Acceptance Testing.
6		Spare Parts	The Ryan Company will provide spare parts list and delivery dates.
7		Seed Sludge Trucking	A local firm has been identified to haul the sludge. Details will be worked out during dry checkout as to amount required.

Process Control Systems Integrator

- Coordinates Factory Acceptance Testing (FAT's) of the control system and insures compliance with approved Process Sequence of Operations.
- Insures timely transmittal of Startup deliverables.
- Provides total integration of all elements in the process control system.
- Communicates with the Startup Manager to facilitate scheduling of appropriate startup resources.

Construction Manager

- Reviews construction activities provided by the general contractor and his organization to support the Startup Manager's schedule.

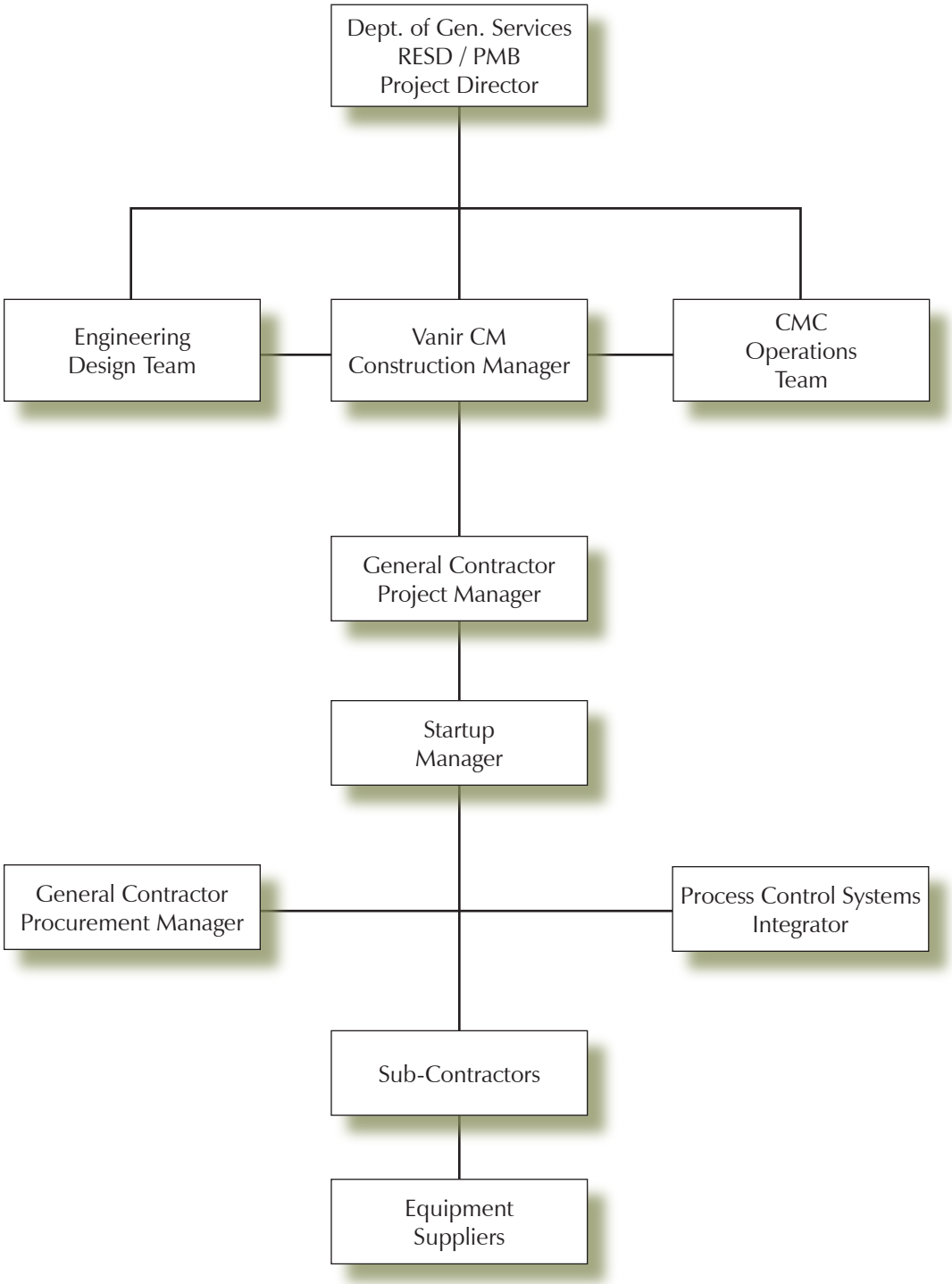
Support Personnel

- Depending on project requirements and magnitude of the project scope of work, startup team members and others will be added as required and assigned specific responsibilities.

Operations Team

- Participate in startup activities
- Assist where needed in startup activities
- Responsible for startup related issues
- Represent operations safety related issues

6.1 Startup Team Organizational Chart



Section 6.0 Startup Planning Activities

The Startup and Commissioning of the CMC Wastewater Treatment Facility is a step by step process as described below:

Pre-Startup

- **Finalize the Operations and Maintenance Organization and Management Systems**

  The operations staffing plan needs to be in place and organized to effectively contribute and participate in the startup as part of the startup team. Working through the trials and tribulations of startup provides valuable knowledge and unique experiences. Operational support systems and training materials need to be setup and available.

- **Creation of the Startup Plan**

  General Contractor shall submit a start-up plan for each piece of equipment and each system not less than 3 weeks prior to the planned initial start-up of equipment or systems. This plan will provide a detailed sub-network of Progress Schedule with the following activities identified:

  1) Manufacturer's Services
  2) Installation Certifications
  3) Operator Training
  4) Submission of Operation and Maintenance Manuals
  5) Functional Testing
  6) Performance Testing
  7) Operational Testing

  The startup plan also provides a testing plan with test logs for each item of equipment and each system when specified (see Appendix A for equipment startup and testing record forms). Finally, the startup plan includes a summary of shutdown requirements for existing systems which are necessary to complete start-up of new equipment and systems.

- **Assignment of the Startup Team Personnel**

  See Section 4 - Roles of Key Startup Personnel

Performance Testing

- **Checkout Equipment**

  Checkout is a function directed by the Startup Manager strongly supported by construction that confirms the equipment and systems are ready for commissioning. Checkout includes; following prepared checklists, doing visual inspections, hydrostatic testing of tanks and pipes, instrumentation loop checkout, verifying interlocks, and stroking valves. Witness and document all checkouts with the appropriate sign-offs on the checkout/commissioning checklists by manufactures representative and commissioning and operations staff.

General Startup & Testing

- **Systems Commissioning**

  Commissioning is the next function, again directed by the Startup Manager, strongly supported by the operations staff in which systems are energized to demonstrate capability and readiness for accepting process waters and beginning initial operations. Commission systems following the planned procedures outlined in this Startup Plan. Document completed tasks with the appropriate sign-offs. The operations team must take responsibility for all preventative maintenance from this point on.

- **Mechanical Inspection**

  - Tag numbers are consistent with the plans and specifications and the unit installed meets the specifications and approved shop drawings.
  - Equipment operation and maintenance manuals have been submitted for approval.
  - All devices are installed correctly as per the drawings and the units are level and functioning correctly.
  - Components such as bearings, gear boxes, drives, packing glands and motors are properly aligned and lubricated.
  - All devices are correctly anchored, mounting hardware is tight and pipes are properly supported.
  - There is no damage to the equipment from installation or moisture.
  - The motor armature rotates freely.
  - Alignment has been adjusted to the proper tolerances.
  - Motors, valves and instructions are properly tagged.
  - Motors are mounted correctly.
  - Motor lubrication is identified and device is properly lubricated.
  - Belts and couplings are proper size and tight.
  - Confirmation that all safety guards are in place.
  - Confirmation that piping, valves and fittings have been pressure tested.
  - Confirmation that the unit is ready to have the motor energized.

- **Electrical Inspection**

  Prior to starting the motor, the electrical contractor will have finished the installation and will state in writing that the electrical system from the bucket to the motor is ready for inspection and motor bump. The State's representative will then, at a minimum, review the system for the following:

  - Proper tag on the Motor Control Center bucket.
  - Starter size and model.
  - Primary voltage lines terminated.
  - Primary voltage fuses in place.
  - Motor starter lines terminated.
  - Motor starter fuses in place.
  - Current settings on projective devices are proper and documented.
  - Inputs from control system are landed on starter.
  - Outputs to control system are landed on HOA switch and motor starter.
  - Local disconnect switch is off and lines are terminated.

- HOA switch is in the off position.
- Confirmation by the electrical foreman that the motor is ready to start.
- Close local disconnect and MCC bucket.
- Bump the motor by moving the HOA switch to H for a moment.
- Confirm proper rotation in the field.
- Amp draw under no load has been checked and documented.
- Start the motor and observe the motor and mechanical system.
- Instruments have been configured, calibrated and the appropriate documentation has been submitted.

- **Dry Commissioning**

In this phase of the Startup (Functional Testing), systems are powered, energized and charged to demonstrate capability and readiness from accepting wastewater and beginning initial operations. All valves shall be stroked, all pumps shall be 'bumped', and run-in tests completed. Commission the systems following the planned procedure.

- **Wet Commissioning**

A. WATER LEAKAGE TEST

1. Before testing water holding structures for leakage

   a. Backfill excavations to top of structure foundations
   b. Cure concrete and obtain specific concrete compression strength
   c. Do not apply brick facing (if specified) or other material that will cover concrete surface until after testing water holding structures for leakage

2. Isolate sections of water holding structures that can be isolated in actual operation. Test each section separately for leakage.

3. Close all valves and gate to structure.

4. Fill water holding structures with clean water to maximum liquid level indicated on the drawings.

5. Make other equipment such as stop gates, sluice gates, valves, and temporary bulkheads watertight, or measure leakage through the other equipment by methods acceptable to the ENGINEER. Do not base leakage upon manufacturer's estimates.

6. Determine evaporation by floating evaporation pan in the structures during testing.

7. Examine concrete surfaces for leaks and damp stops during the first 24 hours after filling structure.

8. When leaks or damp spots appear on the exposed surfaces.

   a. Mark visible leaks and damp stops

b. Drain structure of water after a minimum of 24 hours of being full.
c. Repair defects causing leaks and damp stops by epoxy injection as specified in Section 03931 on both the interior and exterior of structure.
d. Refill water holding structure.
e. Repeat testing and repeat repair process until no leaks or damp spots appear.

9. When water volume loss exceeds 0.10 percent of the water volume originally held with allowance for equipment leakage, evaporation, and precipitation:

a. Determine cause of volume loss.
b. Drain structure of water.
c. Repair defects causing loss of water volume.
d. Refill water holding structure.
e. Repeat testing and repair process until volume loss does not exceed 0.10 percent of the water volume originally held in 24 hours.

- **Hydraulic Flow Verification**

Following wet testing, the Hydraulic Flow Verification process will be started. During the 48-hour flow verification process, the following activities will be performed:

- All systems and equipment will be operated in automatic and manual modes.
- Operational set points will be verified and checked for functionality.
- Instrumentation and controls will be tested to verify proper operation and correct display.
- Alarms will be tested to verify proper operation.
- Gates and valves will be exercised.

Functional Testing

- **Conduct Functional Testing**

Conduct testing of the process system (with clean water) as required by contract documents to demonstrate and confirm the capability and stability of the process system. Build up run time on the system before starting the performance test.

Let the operations staff develop skill and experience operating the new system. Follow the performance test procedure, complete a pre-performance checklist and obtain sign-off approval to begin testing. Perform a preliminary test run and make adjustments to ensure the system operates properly over the range of required operational parameters. At the conclusion of the testing, gather all the data, trend charts, analyses and other necessary information as backup to be compiled as part of the test report documentation.

Operator Training

- **Sequence of Introducing Wastewater**

  At the completion of the Flow Verification phase, all process treatment tanks are to be empty as best as possible (note: do not drain the level of the Ox-Ditch below the air diffusers and/or Jet Aeration Pumps). All valves, pumps and related instrumentation and controls are to be set for processing wastewater in a forward flow scheme. Operations personnel are to be familiar with the HMI and control systems with knowledge of how to operate all of the equipment in automatic and manual modes. Operations personnel are to receive operational training from equipment suppliers on specific equipment operational procedures, control set points, and HMI operations prior to the introduction of process waters. Operations personnel are to be familiar with the Operations Manuals and the requirements for the safe and efficient operation of all components for each system and subsystem associated with the wastewater treatment equipment prior to the introduction of wastewater.

- **See Section 8 - Training Program**

Operational Testing

- **Wastewater Treatment System Biological Startup Procedures**

  The treatment process is capable of biologically treating the wastewater generated at the CMC Wastewater Treatment Plant and meeting the required discharge parameters. The treatment system treats the wastewater in a sequential mode of operation. Prior to using any procedures described in this section, all equipment must be properly installed and checked.

  To operate effectively, wastewater treatment must begin with the proper startup sequence of the treatment system. The procedures outlined in this section are to be followed when seeding and starting up the plant. During the initial startup of the Wastewater Treatment Plant, influent flow rates are going to be very low. Because of this issue, the plan is to seed one Ox-Ditch initially with biomass because there will be an insufficient food supply to support the biomass of two basins.

  Each Oxidation Ditch has approximately 1.5 million gallons of capacity. For biomass seeding purposes, we will shoot for a minimum biomass concentration of 500 mg/L MLSS in the Oxidation Ditch to be started. In order to achieve this, 103,000 gallons of waste activated sludge at a concentration of 7500 mg/L MLSS will have to be trucked in from a local WWTP. The seed sludge will be fed with available incoming wastewater flows and given time to acclimate and reproduce as the Oxidation Ditch continues to fill to an adequate operating level.

  It should be noted that the design MLSS concentration is 3,600 mg/L @ TWL. While 500 mg/L will start the process, it will likely not produce a satisfactory effluent for discharge. This water will be discharged to Chorro Creek and Dairy Creek Golf Course.

- **Introduce Process Waters (Untreated Influent)**

  The system is ready to accept process waters for treatment and to produce a satisfactory effluent that meets design criteria in a safe and efficient manner. Begin introducing process waters ramping up the process to design conditions while making process adjustments to optimize system performance.

Close-out Procedures

- **Finalize Documentation**

  Do not let project personnel depart the project before they complete and submit the final documentation they are responsible for delivering. Properly updating and finalizing startup documentation supports the overall closeout of the project. Final documentation can be used by the operations staff for future reference and problem solving.

Section 7.0 Startup Milestones

MILESTONE ACTIVITIES	MILESTONE DATES
Startup & Functional/Operational Testing Plan Completed for Review	N/A
Operator Training Plan Completed for Review	N/A
Acceptance Testing Plan Completed for Review	N/A
Submit Startup & Functional Testing Plan for Review	N/A
Submit Operator Training Plan for Review	N/A
Submit Acceptance Testing Plan for Review	05-29-07
Complete Review of Testing Plans	N/A
Mechanical Systems Completed	03-31-07
Electrical Systems Completed	04-12-07
Begin the Hydraulic Testing & Profile Verification	12-18-06
Complete Hydraulic Testing & Profile Verification	12-21-06
Begin Wet Testing with Clean Water	12-18-06
Begin Startup Testing	04-02-07
Begin Function Testing	04-30-07
Begin Operator Training	05-15-07
Complete Function Testing	04-30-07
Begin Instrumentation Ring-Out Testing	04-30-07
Complete Instrumentation Ring-Out Testing	05-30-07
Begin Bio-mass Seeding	05-29-07
Complete Bio-mass Seeding	05-29-07
Begin Operational Testing	05-30-07
Complete Operational Testing	"In Process"
Punch List Completion	"In Process"
Cleanup & Demobilization	"In Process"
Sign-Off	

Section 8.0 Actual Functional Testing & Startup Outline

The following is an excerpt from an e-mail submitted by the General Contractor and approved by the Design Engineer, which included an outline of the functional testing and startup process to be conducted as follows:

Now that the west side of the Oxidation Ditch is at el.209 (17 day duration), we can project filling the other side of the Ox. Ditch and determine a testing date for for the Aerators and Mixers. We have discussed the fill line with the Aerator Manufacturer and they require a full load test to the maximum fill line of el.210. Based on this projection, we have developed a plan outline that we can discuss and apply dates to the remainder of the equipment testing:

Note: We will take daily water level measurements now that we have begun filling the east Ox. Ditch in order to keep better track of the fill dates to el.210.

Note: Functional start-up date dependent on installation of 125 volt battery system at Switchgear.

1. *Fill Ox. Ditch west 9/8/06 thru 9/25/06(17 days) then 10/16 & 10/17(2 days to el.210)Note: Slide gates closed @ el.209*

2. *Fill Ox. Ditch east 9/26/06 thru 10/15/06(19 days to el.210)Note: Slide gates closed @ el.209*

3. *Schedule Manuf. Reps. for Aerators, Mixers, Headworks Dry Pit Pumps and Grit Classifier for Monday/Tuesday 10/18-10/20/06.*

4. *Transfer fresh water flow from hydrant to headworks for flow to run Headworks dry-pit pumps and Mechanical Bar Screens(10/18/06) This flow will also fill the Grit Chamber so that we can also test the Grit Classifier. Circulate this isolated system water back to the Ox. Ditch.(need minimum plant flow rate and hydrant flow rate to ensure hydrant volume will be sufficient). We would continue running this system to complete the functional testing of this segment of the plant.(10/20/06)*

   Note: Shut sluice gate at Mixed Liquor Splitter Box to maintain el.210 water level in Ox. Ditch.

5. *The next segment of testing should be the Secondary Clarifiers and RAS/WAS pumps. The Clarifiers could be filled by releasing water from the Oxidation Ditch lowering the water level to el.209. Depending on the release rate through the Ox. Ditch slide gates, which would be helped by keeping water flowing from the hydrant into the clarifiers, the Secondary Clarifiers would be filled in 5 days(10/27/06)Manufacturers Rep. on site for wet testing Clarifiers(10/30-10/31/06) After the clarifiers are filled, water can be released to the RAS/WAS pumps(11/01/06) which can be operated and valve-directed to discharge back to the Ox. Ditch.(at this stage the hydrant can be shut down since water will be recirculating from Ox. Ditch to Clarifiers to RAS/WAS pumps to Ox. Ditch) Manuf. Rep. on site for testing RAS/WAS pumps(11/2-11/3/06)*

6. *The Tertiary Filter sand requires fresh water flushing of the filter sand media prior to starting up the system.(11/2-11/3/06). After flushing, fill the tertiary filters and Chlorine Contact basin with the hydrant into the Ox. Ditch over-flowing through the Clarifiers into the tertiary and chlorine contact basin(plug 16" outlet at the basin flume) 11/6-11/10/06 This step should also include a 6" pump to be set near the chlorine contact basin to pump back into the Oxidation Ditch. With all systems full, pump from the chlorine contact basin into the Oxidation Ditch to create a recirculatory flow through the Ox. Ditch, Clarifiers, Tertiary Filters and Chlorine Contact Basin for testing. Begin testing Filter Flash Mixer, Tertiary Filter and Compressor system, sample pumps, plant water pumps, Anoxic Mixers and Reclaimed Water Pumps. Manufacturers Reps. on site for testing the week of(11/13-11/17/06)*

The above completes the testing for equipment required for plant operational testing with fresh water. During this functional testing the Chlor/Dechlor chemical Systems and plant controls system should be completed and tested during the week ending 11/17/06.

Begin plant operational testing with fresh water 11/20/06

Section 9.0 Training Program

The training program for the CMC Wastewater Treatment Plant will consist of several important phases. Components of training will include on-the-job training and specialized training by the equipment vendors. While theoretical discussion may be beneficial, the most valuable training will be conducted hands-on.

Goals and Objectives

The goals and objectives of the training program are as follows:

- Review process design and project documentation.
- Review Operations Manual and familiarize operators with all sections including operating procedures, special systems, and equipment maintenance requirements.
- Provide level of training that enables Operations to effectively staff/operate plant and meet treatment plant performance objectives.
- Ensure safety of all operators.

Components of Training

The following sections describe the main elements of each training phase.

Classroom (approximately 40 hours)

Depending on the number of operators to be trained, the classroom may be conducted as one large group or alternately, in several smaller classes. An outline of topics to be reviewed is as follows:

- Purpose of plant – treatment goals and performance objectives
- Preliminary Treatment (Headwork's)
- Biological Treatment Control Parameters
- Sequence of Operation
- Effluent Equalization and Disinfection
- Process flow schematic
- Overall plant layout
- Plant P&IDs
- O&M Manuals
- Safety operating procedures
- Special systems
- Critical operating parameters
- Maintenance Procedures
- Sampling and Monitoring Plans
- Troubleshooting
- SCADA package

During the classroom training, several exercises will be conducted to test the operators understanding of concepts presented.

On-the-Job Hands-On (Approx. 40 Hours)

This phase of training is actual hands-on and begins during the pre-commissioning phase when the mechanical and electrical systems are being checked out. The training continues as the plant is commissioned (wet tested) and the process startup effort is completed.

The purpose of the hands-on training is to validate concepts and principals. The lists of activities that will be completed during the hands-on phase of training include:

- Familiarize operators with all equipment, instrument, and valve locations
- Demonstrate knowledge of operating procedures
- Participate in facility acceptance procedures
- Review SCADA system and operator interface
- Review special procedures/systems

Additional Specialized Training

The additional specialized training will be conducted during startup while the vendor's representatives are on-site to checkout and commission their equipment. This training will be a mixture of formal and informal hands-on training.

- PLC & HMI – Two (2) days training
- Bar Screen Equipment – One (1) day training
- Grit Chamber Equipment - One (1) day training
- Odor Control Unit – One (1) day training
- Chlor/Dechlor System – One (1) day training
- Electrical Generation System – One (1) day training
- Additional training as required by CMC, state or local agencies

Section 10.0 Contact List

Company / Agency	Name / Title	Business Address	Phone	Fax	E-Mail
State of California Department of General services	Dennis Wehsels Project Director	Dept. of General Services RESD/PMB 707 Third Street, Third Floor West Sacramento, CA 95605	916-376-1653	916-376-1742	dennis.wehsels@dgs.ca.gov
State of California Department of General services	Rick Auch Construction Supervisor I	Dept. of General Services RESD/PSB 320 West Fourth Street, Suite 330 Los Angeles, CA 90013	805-542-9705	805-542-9831	rick.auch@dgs.ca.gov
State of California Department of General services	Bob Noack Construction Inspector II	Dept. of General Services RESD/PSB 320 West Fourth Street, Suite 330 Los Angeles, CA 90013	805-542-9705	805-542-9831	robert.noack@dgs.ca.gov
State of California Department of Corrections California Men's Colony	John Kellerman Corr. Plant Supervisor	California Men's Colony P.O. Box 8101 San Luis Obispo, CA 93409	805-547-7974	805-547-7548	jill.holden@corr.ca.gov
State of California Department of Corrections California Men's Colony	Gerald Elwood Chief Engineer	California Men's Colony P.O. Box 8101 San Luis Obispo, CA 93409	805-547-7974	805-547-7548	
State of California Department of Corrections California Men's Colony	Maryann Alves Wright Associate Warden Business Services	California Men's Colony P.O. Box 8101 San Luis Obispo, CA 93409	805-547-7918	805-547-7520	mary.alves-wright@corr.ca.gov
State of California Department of Corrections California Men's Colony	Bill Cook				w.cook@sbcglobal.net
State of California Department of Corrections California Men's Colony	Bob Barloqio	California Men's Colony P.O. Box 8101 San Luis Obispo, CA 93409	805-547-7657	805-784-9226	
State of California Department of Corrections California Men's Colony	Shelley Thompson Public Info	California Men's Colony P.O. Box 8101 San Luis Obispo, CA 93409	805-547-7948	805-547-7548	Use Maryann Wright's
State of California Department of Corrections California Men's Colony	Tom Fifield PG&E Rep	California Men's Colony P.O. Box 8101 San Luis Obispo, CA 93409	805-547-7927	805-547-7548	Use Maryann Wright's

Company / Agency	Name / Title	Business Address	Phone	Fax	E-Mail
State of California Department of Corrections California Men's Colony	Nancy Lowe Telecons Rep	California Men's Colony P.O. Box 8101 San Luis Obispo, CA 93409			Use Maryann Wright's
State of California Department of Corrections California Men's Colony	Steven Mahoney	California Men's Colony P.O. Box 8101 San Luis Obispo, CA 93409	805-547-7849	805-547-7863	Use Maryann Wright's
Vanir Construction Management, Inc.	Mohamed Habbal VP / Area Director	100 Cross Street, Suite 203 San Luis Obispo, CA 93401	805-541-1425	805-541-1940	mohamed.habbal@vanir.com
Vanir Construction Management, Inc.	Lisa Millar Sr. Project Manager	100 Cross Street, Suite 203 San Luis Obispo, CA 93401	805-542-9705 project site	805-542-9831 project site	lisa.millar@vanir.com
Vanir Construction Management, Inc.	Troy Hart Construction Manager	100 Cross Street, Suite 203 San Luis Obispo, CA 93401	805-226-8133 project site	805-226-9875 project site	troy.hart@vanir.com
Vanir Construction Management, Inc.	Paul Burns Field Engineer	100 Cross Street, Suite 203 San Luis Obispo, CA 93401	805-542-9705 project site	805-542-9831 project site	paul.burns@vanir.com
Vanir Construction Management, Inc.	Bob Buckingham Construction Manager	100 Cross Street, Suite 203 San Luis Obispo, CA 93401	805-542-9705 project site	805-542-9831 project site	bob.buckingham@vanir.com
Vanir Construction Management, Inc.	Debra Given Administrative Assistant	100 Cross Street, Suite 203 San Luis Obispo, CA 93401	805-542-9705 project site	805-542-9831 project site	debra.given@vanir.com
CA Army National Guard Camp San Luis Obispo	Maj. Mark Johnson Director of Personnel & Community Affairs	Camp San Luis Obispo ATTN: Post Headquarters P.O. Box 4360 San Luis Obispo, CA 93403	805-594-6505	805-594-6526	mark.johnson@ca.ngb.army.mil
State of California Military Department Camp San Luis Obispo	Maj. Nicole Balliet Director of Industrial Operations	Camp San Luis Obispo ATTN: Post Headquarters P.O. Box 4360 San Luis Obispo, CA 93403	805-594-6502	805-594-6526	nicole.balliet@ca.ngb.army.mil
State of California Military Department Camp San Luis Obispo	1LT Jarrod Bassnet OIC SECFOR	Camp San Luis Obispo ATTN: Post Headquarters P.O. Box 4360 San Luis Obispo, CA 93403	805-594-6364	805-594-6526	jarrod.bassnet@ca.ngb.army.mil
State of California Military Department Camp San Luis Obispo	Harry Machado		805-594-6692	805-459-3477	hxm6@thegrid.net

Company / Agency	Name / Title	Business Address	Phone	Fax	E-Mail
State of California Environmental Department Camp San Luis Obispo	Chris Wilde Environmental Office		805-594-6543		chris.wilde@ca.ngb.army.mil
State of California Military Department Camp San Luis Obispo	Jim Kendrick Building Trades Supervisor	Camp San Luis Obispo ATTN: Post Headquarters P.O. Box 4360 San Luis Obispo, CA 93403	805-594-6544	805-594-6366	james.kendrick@us.army.mil
State of California Military Department Camp San Luis Obispo	Stephen Dobbins Information Services Branch Chief	Camp San Luis Obispo ATTN: Post Headquarters P.O. Box 4360 San Luis Obispo, CA 93403	805-594-6518	805-594-6588	stephen.dobbins@ca.ngb.army.mil
Carollo Engineers	Steve Swanback Project Manager	2700 Ygnacio Valley Road Suite 330 Walnut Creek, CA 94598	925-932-1710	925-930-0208	sswanback@carollo.com
Carollo Engineers	Barry Hampson Sr. Project Engineer	14785 Preston Road Suite 950 Dallas, TX 75254	972-239-9949	972-239-9117	bhampson@carollo.com
Carollo Engineers	Mike Dadik Structural Engineer	2700 Ygnacio Valley Road Suite 330 Walnut Creek, CA 94598	925-932-1710	925-930-0208	mdadik@carollo.com
Carollo Engineers	Jerry Sarkisian Electrical Engineer	7580 North Ingram Ave Suite 112 Fresno, CA 93711	559-436-6616	559-436-1191	gsarkisian@carollo.com
Carollo Engineers	Charlie Chung Instrumentation Engineer	2700 Ygnacio Valley Road Suite 330 Walnut Creek, CA 94598	925-932-1710	925-930-0208	cchung@carollo.com
Carollo Engineers	Ryan Hook Assoc. Project Engineer	250 Venture Oaks Way Suite 320 Sacramento, CA 95833	916-565-4888	916-565-4880	rhook@carollo.com
PG&E	J.T. Haas Electrical Engineer Pacific Gas & Electric		805-546-5234		jth1@pge.com
AT&T/SBC	Lou Gianoly SBC/AT&T		805-546-7451		
Air Pollution Control Board	Mark Elliott AQ Specialist III	Air Pollution Control Board County of San Luis Obispo 3433 Roberto Court San Luis Obispo, CA 93401	805-781-5912	805-781-1002	melliott@co.slo.ca.us
Air Pollution Control Board	Tim Fuhs AQ Specialist II	Air Pollution Control Board County of San Luis Obispo 3433 Roberto Court San Luis Obispo, CA 93401	805-781-5912	805-781-1002	tfuhs_apcd@co.slo.ca.us
The Ryan Company	Joseph Bellucci President	25 Constitution Drive Taunton, MA 02780-1071	508-742-2500	508-742-2540	jbellucci@ryancompany.net
The Ryan Company	Jeffrey Tobasky Scheduler	25 Constitution Drive Taunton, MA 02780	508-742-2500	508-742-2540	jtobasky@ryancompany.net

Company / Agency	Name / Title	Business Address	Phone	Fax	E-Mail
The Ryan Company	Charles Conroy Operations Manager	CMC Project Site	805-542-9936	805-542-9956	cconroy@ryancompany.net
The Ryan Company	Lee Mitchell Project Manager	CMC Project Site	805-542-9936	805-542-9956	lmitchell@ryancompany.net
Regional Water Quality Control Board	Matt Thompson	Regional Water Quality Control Board	805-549-3159	805-788-3572	mthomso@rb3.swrcb.ca.gov
Cuesta College	Pete Pedroni Director of Facilities Planning	Cuesta College San Luis Obispo Campus P.O. Box 8106 San Luis Obispo, CA 93403	805-546-3172	805-546-3173	ppedroni@cuesta.edu
Cuesta College	Terry Reece Director of Maintenance	Cuesta College San Luis Obispo Campus P.O. Box 8106 San Luis Obispo, CA 93403	805-546-3283		
Cuesta College Police	Loretta		805-546-3205		
Southern California Gas Company	Stephen Beltran Energy Technician	750 Industrial Way, SC9373 San Luis Obispo, CA 93401	800-427-1919	800-633-4310	

Appendix A - "Standard Forms"

- Equipment Manufactures Certification of Training Form
- Equipment Manufactures Certification of Startup and Testing
- State Inspection Report Form
- Equipment/Material Defect Report Form
- General Contractors Warranty Form
- Risk Management Punch List

EQUIPMENT MANUFACTURES CERTIFICATE OF TRAINING

Location	**Specify Contract:**

Purchase Order No. _____

EQUIPMENT SPECIFICATION SECTION_____

EQUIPMENT TAG AND DESCRIPTION_____

_____

I _____ authorized representative of
(Print Name)

_____
(Print Manufacture's Name)

hereby CERTIFY that_____
(Print equipment name and model with serial number)

installed for the subject project [has] [have] been installed in a satisfactory manner, [has] [have] been satisfactory tested, [is] [are] ready for operation, and the assigned operating personnel have been suitably instructed in the operation, lubrication and care of the unit[s] on Date: _____ Time: _____.

CERTIFIED BY: _____ DATE: _____
(Signature of Manufacture's Representative)

ACKNOWLEDGMENT OF MANUFACTURER'S INSTRUCTION/TRAINING

[I] [We] the undersigned, acknowledge that the plant operating personnel have received classroom and hands- on instruction and training on the operation, lubrication and maintenance of the subject equipment and that operating personnel are prepared to assume normal operational responsibility for the equipment: (Attach a separate training sign-in sheet with the name(s), company represented, title and phone numbers of all participants in the training)

Ryan Construction		DATE:	
CMC/Operations Rep.		DATE:	
Owner's Representative (Vanir)		DATE:	

EQUIPMENT MANUFACTURES CERTIFICATE OF STARTUP AND TESTING

Location	**Specify Contract:**

Purchase Order No. _____

EQUIPMENT SPECIFICATION SECTION_____

EQUIPMENT TAG AND DESCRIPTION_____

_____

I _____ authorized representative of
(Print Name)

_____
(Print Manufacture's Name)

hereby CERTIFY that_____
(Print equipment name and model with serial number)

installed for the subject property [has] [have] been installed, aligned and lubricated in a satisfactory manner and is ready for operation.

CERTIFIED BY: _____ DATE: _____
(Signature of Manufacture's Representative)

COMMENTS:

_____

_____

_____

_____

State of California • Arnold Schwarzenegger, Governor

DEPARTMENT OF GENERAL SERVICES
REAL ESTATE SERVICES DIVISION
CONSTRUCTION SERVICES SECTION – AREA III, LOS ANGELES

Project Name:
W.O. #:

INSPECTION / TESTING REQUEST

Request No. _____

To: Real Estate Services Division
Construction Services Section

Request By: _____
Request Date: _____
Inspection Date: _____

Description of item to be inspected:
_____
_____
Location: _____

Time: _____

☐ Specified Test/Inspection Spec Section _____ Time: _____

Description of Test/Inspection:
_____
Location: _____
_____

Results/Deficiencies noted: _____
_____
_____
_____

A request for inspection must be received by Construction Services for any deficient work or Exception Notice will be written. Construction Services signature on this form does not relieve the contractor of responsibility for the quality or accuracy of the installed work.

Inspected/Witnessed By: _____ Pass/Fail_____

Date: _____ Time: _____Spec. Section: _____

Weekend, Holiday Work or Special Inspection (48 hour minimum notification will be required).

California Men's Colony
Wastewater Collection Treatment Upgrade
Operational Testing
Equipment/Material Defect Notification

General Contractor: The Ryan Company
25 Constitution Drive
Taunton, MA 02780

Telephone: (508) 742-2500 Onsite Office Number 542-9936
Onsite Fax Number 542-9956

Contact Persons: Lee Mitchell (619) 247-3806

Date of Occurrence:_____ Date of Contractor Notification: _____

Equipment/Work:_____

Serial #: _____

Model#:_____

Addit'l Info:_____

Problem: _____

_____

_____

_____

_____

Status:

_____

_____

Supplier/Manufacturer:_____

Telephone/Fax: _____

Contact Person: _____

Per Specification Section 01756, 1.07 "Operational Testing", contractor is to immediately correct defects in material, workmanship, or equipment which becomes evident during operational test.

California Men's Colony
Wastewater Collection Treatment Upgrade
Operational Testing
General Contractors Warranty form

General Contractor: The Ryan Company
25 Constitution Drive
Taunton, MA 02780

Telephone: (508) 742-2500

Contact Persons: Lee Mitchell (619) 247-3806

Date of Occurrence: _____ Date of Contractor Notification: _____

Equipment/Work: _____
Serial #: _____
Model#: _____
Addit'l Info: _____

Problem: _____

_____

_____

_____

Status: _____

Subcontractor: _____

Telephone/Fax: _____

Contact Person: _____

Supplier/Manufacturer: _____

Telephone/Fax: _____

Contact Person: _____

Contact John Kellerman, Corrections Plant Supervisor, at (805) 547-7974 for questions regarding the noted failed equipment/work and to schedule correction on site.

Per Contract General Conditions Article 42, during the warranty period if the Contractor does not respond within ten (10) calendar days of written notice of defective work and does not fulfill the terms of the guarantee within a reasonable period of time, the Department, Owner, has the authority to proceed to have such work done at the Contractor's expense and the Contractor will pay cost thereof upon demand.

STARTUP RISK MANAGEMENT PUNCHLIST

Project: California Men's Colony Wastewater Collection Treatment Upgrade **Location:** San Luis Obispo, California

Contract No: 106153 **Edit Date:** 06-15-2007

Item No:	Data Added	Description	Priority 1=Hi 2=Med 3=Lo	Corrective Action/ Contingency	Responsibility	Date Completed
1		Approximately 100,000 gal. of seed sludge needed for each unit	1	The plan is to use active sludge from the existing facility	Client	
2		The influent flow will be minimal at startup and this will result in a low F/M ratio for the new biomass	1	Initially one unit will be in operation until influent flow increases. Flow however may still be too low for one basin	Client	
3		Either the blower intake filters purchased need to be the cleanable type, or spare filters will be needed on site for startup to remove dust typically generated during the construction activities	2	Spare parts ordered by GC. Blower intake area should be free of dust by startup befor performance testing commences and new filters installed	GC/Mech	
4		Since there is no bypass around the motorized valves, use the manual control to operate	1	Valves have a manual override for this purpose	GC	
5		A substantial quantity of clean water should be available for hydrostatic & wet testing of equipment. Hoses, hose connections, etc. must be on site prior to startup	1	The plan is to use fire hydrant water for this purpose. Hoses and proper connection need to be on site prior to startup and left in place until after hydraulic verification	Plant/GC	
6		Construction must be substantially complete prior to sending startup personnel to site	2	Schedule is to have all systems, except the generator substantially complete	Mech/Elect/GC	
7		A third party lab needs to be selected & set up prior to startup to perform tests	2	Not required. In-house lab will perform all necessary testing	Client	

VANIR
100 Cross Street, Suite 203
San Luis Obispo, California 93401-7570
Tel: 805.541.1425
Fax: 805.541.1940
www.vanir.com

STATE OF CALIFORNIA

DEPARTMENT OF GENERAL SERVICES

Project Management Branch, Real Estate Services Division

Department of Corrections & Rehabilitation

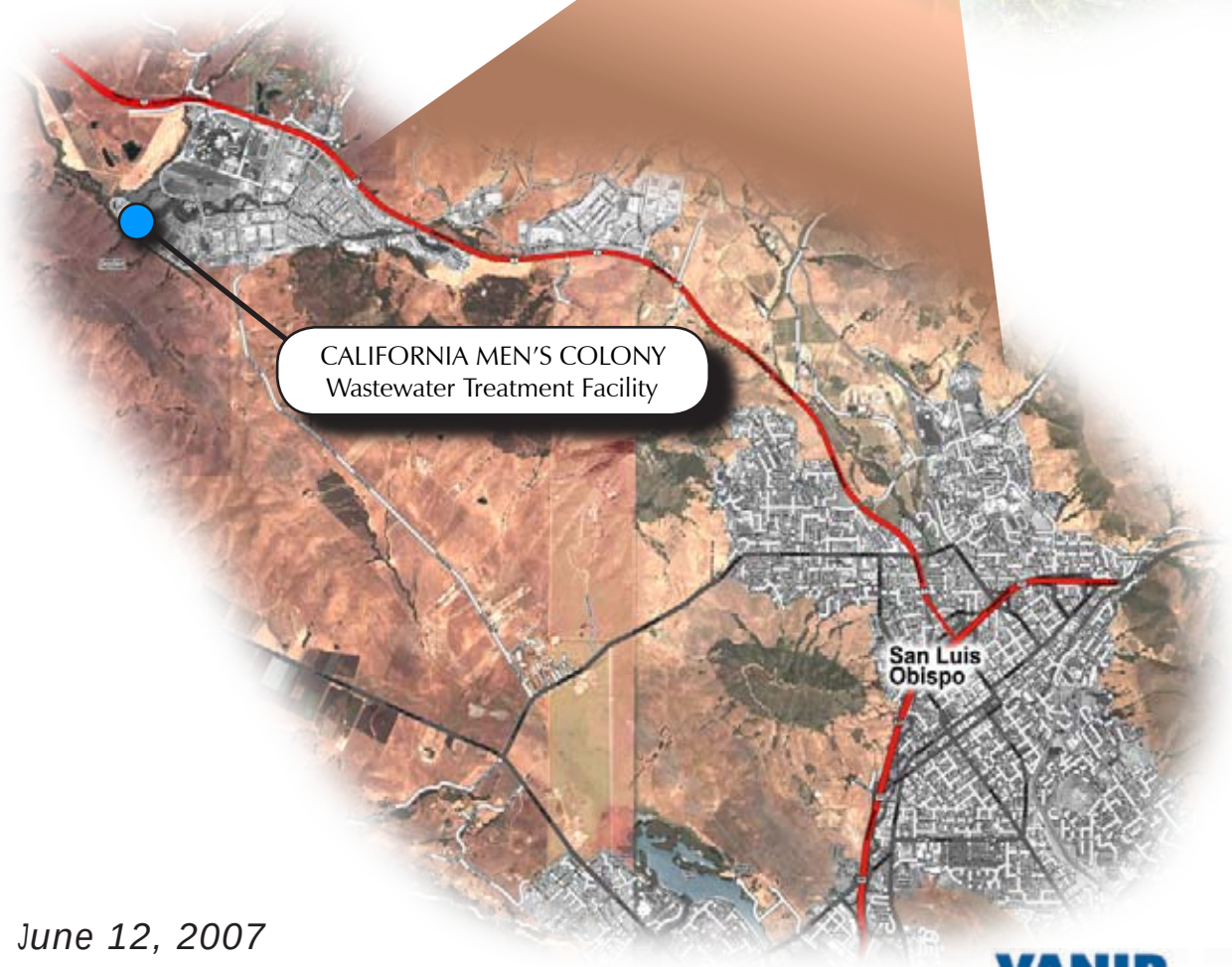
California Men's Colony

Wastewater Collection Treatment Upgrade

Startup Plan

BOOK 2

Detailed Startup Procedure



June 12, 2007

VANIR

VANIR CONSTRUCTION MANAGEMENT, INC.

Table of Contents

BOOK 2 - Detailed Startup Procedures

Section 1.0 Startup Procedures

1.0 Introduction

Book 2 of this report details the actual startup and shutdown procedures for the California Men's Colony — Wastewater Collection Treatment Upgrade. It has been written with the assumption that all safety interlocks are functional, and the process and equipment are operating in automatic mode.

This section also describes alarm conditions that can occur during operation of the major equipment and processes at the plant. The alarms are provided for operational surveillance of the equipment and processes, alerting operators to possible problems. Even though alarms will occasionally clear by themselves, in the automatic control system, an operator should always investigate the reason why an alarm sounded. Each alarm heading is followed by a statement, which describes where the alarm is indicated along with the suggested correction actions.

1.1 Startup Requirements

Prior to commencing the startup procedures, all piping and equipment should be in place and tested by the contractor and/or manufacturer. At this point of the startup, each equipment package must be capable of operating in Automatic Mode, including:

1. Dissolved air floatation thickener (DAFT)
    a. Recirculation pump
    b. Air saturation system
2. Air compressor
3. Air saturation tank
4. Safety air relief valves
5. Recycle flow control valve
    a. Polymer dilution system
    b. TWAS pumps
    c. Clarifier weirs leveled with water to within 1/8 inch (engineer to verify)
    d. Clarifier drive inspected by manufacturer
    e. Sludge scrapers adjusted
6. Dewatering
    a. Belt Filter Press

b. Sludge feed pumps

c. Polymer dilution system

d. Sludge conveyers

e. Provisions for handling dewatered cake

The following startup procedures are based upon normal conditions and circumstances. They should be used knowing that extraordinary conditions and circumstances may require modifications of the steps for personnel safety and to ensure that equipment damage or process upsets do not occur. Operators should be trained in plant safety (*see Book 1 - Section 9.0 of this report*). When in doubt about the appropriateness of procedures, an operator should consult with the supervisor(s) and/or manufacturer's Operations & Maintenance Manual.

The procedures are organized into three separate area as follows:

- Mechanical Startup
- Electrical Startup
- Instrumentation Startup

Section 2.0 Mechanical Startup

Verify that:

Tag numbers are consistent with the plans and specifications and the unit installed meets the specifications and approved shop drawings.

- Equipment operation and maintenance manuals have been submitted for approval.
- All devices are installed correctly as per the drawings and the units are level and functioning correctly.
- Components such as bearings, gear boxes, drives, packing glands and motors are properly aligned and lubricated.
- All devices are correctly anchored, mounting hardware is tight and pipes are properly supported.
- There is no damage to the equipment from installation or moisture.
- The motor armature rotates freely.
- Alignment has been adjusted to the proper tolerances.
- Motors, valves and instructions are properly tagged.
- Motors are mounted correctly.
- Motor lubrication is identified and device is properly lubricated.
- Belts and couplings are proper size and tight.
- Confirmation that all safety guards are in place.
- Confirmation that piping, valves and fittings have been pressure tested.
- Confirmation that the unit is ready to have the motor energized.

2.1 – Headworks & Influent Pump Station

2.1.0 GENERAL PROCESS DESCRIPTION

Raw Wastewater (RWW) enters the California Men's Colony (CMC) wastewater treatment facility (WWTF) headworks / influent pump station via 24-inch Sanitary Sewer (24-inch SS). The headworks and influent pump station are located in the same building.

The headwork / influent pump station consists of a Parshall flume flow meter channel, two mechanical bar screens, screening washer compactor, and influent pumps.

The headworks facility is the preliminary treatment process portion of the CMC WWTF. The mechanical bar screens remove screenings (plastics and floatables) from the raw wastewater stream. Screening of the influent wastewater protects the downstream equipment and processes from damage and impairment by removing larger-sized, non-biodegradable solids by stopping and retaining this material on the screen face. Screenings are removed automatically from the screen face by the rake arm and deposited in a compactor, compacted and then deposited in a disposal bin.

The influent pump station pumps raw wastewater and plant drain flow into the aerated grit chamber. The pump station consists of a divided wet well and a separate dry well area with three dry-pit submersible pumps with variable speed drives.

2.1.1 Startup/Shutdown Procedures

The following is a brief description of the Headworks process startup and shutdown procedures. Refer to the equipment O&M manuals for specific information regarding lubrication and specific equipment checks.

Startup

Bar Screens

Pre-Startup Safety Checks

1. Verify that all equipment is off and locked out.
2. Lube equipment as required by the manufacturers.
3. Check that the bar screen structure is free from debris and that personnel are not working in the channels.
4. Walk through and inspect facility to verify that no foreign materials are laying in the screw compactor.
5. Walk through and visually inspect facility to verify that no foreign materials are lying in the bar screen channels.
6. Check that all anchor bolts and fastening devices are secure.
7. When any wires relative to the drive motor or power supply have been disconnected, disconnect drive assemblies and check for proper rotation. After checking rotation, reconnect the drive.
8. Check that all drive assembly components and guards are in place and are properly aligned and tensioned.
9. Verify breakers for bar screens, pumps, screw compactor, safety equipment, analyzers and bubbler system are closed.
10. Verify that Plant Water Solenoid valves are working properly.

11. Verify that alarm systems are ready. Verify the Personnel Entry Safety System is operational.
12. Check ultrasonic level indicating system to verify all system components are working properly.

Startup Procedure

1. If not currently on, turn on the exhaust fan (01-FAB-003) before entering the stairs of the wet well. Set the main disconnects for the fan to "ON" Start the fan at the local pushbutton stations located near each of the fan. Verify that the fans are operating properly.
2. Select the bar screen to be in service. For that screen, verify proper operation by placing the bar screen in Hand and operating through one cycle.
3. Open discharge slide gates for channel in service and open inlet slide gate. Verify that wastewater is flowing into the channel. Verify that the ultrasonic level transducer is detecting a flow level in the channel.
4. Open discharge valves for the influent pumps. Verify start and stop level set points. Verify proper operation of the pumps.

Screenings Washer and Compactor

Pre-startup Safety Checks

1. Verify that all equipment is off and locked out.
2. Lube equipment as required by the manufacturers.
3. Walk through and inspect facility to verify that no foreign materials are laying on the screenings conveyor.
4. Check that all anchor bolts and fastening devices are secure.
5. Check that all drive assembly components and guards are in place and are properly aligned and tensioned.
6. Verify that alarm systems are ready.
7. Perform all manufacturers' recommended pre-startup procedures. Refer to the manufacturer's operation and maintenance manual.

Startup Procedure

1. Remove Lockout tags.
2. Verify the power is on at the MCC for each piece of equipment.
3. Set screenings screw compactor in hand mode. Start compactor. Verify proper operation of compactor.
4. Stop screw compactor. Set screw compactor in Auto mode.

Influent Pumps

Pre-startup Safety Checks

1. Verify that all equipment is off and locked out.
2. Walk through and inspect facility to verify that no foreign materials are laying in the influent pump wet and dry wells.
3. Check that all anchor bolts and fastening devices are secure.
4. Verify that alarm systems are ready.
5. Perform all manufacturers' recommended pre-startup procedures. Refer to the manufacturer's operation and maintenance manual.

Startup Procedure

1. Remove lockout tags.
2. Verify that power is on for each piece of equipment.

3. Place influent pumps in hand and start. Verify proper operation of the pump.
4. Stop pumps and place in auto mode.

Shutdown

Bar Screens

1. Since the bar screens are designed to have a minimum of one bar screen operational at all times, verify that the bar screen to be put in service and the bypass channel are available before taking a bar screen out of service.
2. Run bar screen in hand to clear grit and debris that may have settled in unit.
3. Open inlet and outlet gates of channel to bar screen to be put in service. Verify proper operation of bar screen.
4. Close inlet and outlet gates of channel to be taken out of service. Stop and lockout bar screen.

Screenings Washer / Screw Compactor

1. If the screw compactor is to be removed from service for an extended period of time, verify by-pass chute is lowered and a dumpster is aligned.
2. Stop and lockout equipment.

Influent Pumps

1. Stop and lockout pump to be removed from service.

2.1.2 ALARM CONDITIONS

This section describes the alarm conditions that can occur during operation of the influent pump station and headworks. The alarms provide for the operational surveillance of the facilities, alerting operators to abnormal conditions. The alarms are monitored by the plant SCADA system. Alarm conditions are annunciated at the Local Control Panel, MCC, and at the OIS system. Consult the manufacturer's O&M manual for more detailed responses to alarm conditions.

Operations Strategy

When an alarm occurs, the operator acknowledges the alarm at the Local Control Panel or OIS, examines the process condition and takes corrective action. The operator then proceeds to the equipment or area originating the alarm. At the equipment (assuming that it is a safe location) that originated the alarm, the operator assesses the problem and determines the actions required. The manufacturer's O&M manual provides specific trouble-shooting procedures.

The following section lists the alarm indications and possible causes.

Bar Screen Failure Alarm

Indication: Bar Screen Failure

Action:
1. Acknowledge alarm at OIS.
2. Check for obstruction of the screen. Lockout equipment and remove obstruction.
3. Reset operation of equipment.

Bar Screen High Torque Alarm

Indication: High torque on bar screen rake indicated at OIS and LCP.

Action:
1. Check if rake is caught on screen
2. Attempt to free rake using the "Reverse" button.
3. Lockout equipment if attempting to remove foreign objects manually as rake will start when released.

Bar Screen High Level Alarm

Indication: High water surface elevation upstream of bar screen indicated at the OIS.

Action:
1. Acknowledge alarm at OIS.
2. Verify bar screen operating cycle is activated.
3. If high level persists, check bar screen failure alarm.
4. Follow procedures for bar screen failure.

Screenings Washer / Compactor

Indication: High water levels in the wet well indicated at the OIS.

Action:
1. Acknowledge alarm at OIS.
2. Reset and restart motor once.
3. If system starts, reset alarm at LCP.
4. If unit fails to start, remove unit from service and check for conveyor clogging.

Influent Pump Station

Wet Well High Water Level

Indication: High water levels in the wet wells indicated at the OIS.

Action:
1. Check operation of pumps.

Wet Well Low Water Level

Indication: Low water in the wet well indicated at the Pump Station Control Panel and OIS.

Action:
1. Determine if pumps failed to stop or if influent lines are blocked.

Pump Motor Stator High Temperature and Moisture Detection Alarm (one per pump)

Indication: Overheating of pump motor or leakage in motor casing indicated at the Pump Station Control Panel and OIS.

Action:
1. Remove pump from service.
2. Insert standby pump into sequence.
3. Determine if impeller is clogged and check motor casing integrity.

Pump Motor Casing Leakage (one per pump)

Indication: Water in motor casing indicated at the Pump Station Control Panel and OIS.

Action:
1. Check integrity of casing.

Pump Fail to Start

Indication: Failure of pump to start when called to operate indicated at the Pump Station Control Panel and OIS.

Action:
1. Insert standby pump into sequence.
2. Troubleshoot control signal and pump function.

2.1.3 SAFETY

These safety instructions are provided as general guidelines only for operation of the headworks facilities. They are not intended to replace existing plant safety instructions and procedures.

- Always lockout any equipment before service or repair. Notify other operators of any unit malfunction and that you intend to repair it. Follow established safety procedures before and during the work.
- Safety precautions should be taken whenever plant operations personnel are working around the headworks. All equipment is capable of remote control operation and may start at any time. Prior to servicing or inspection, all equipment controls should be stopped and locked out locally.
- Keep combustible gas detectors in good working order to prevent a hazardous environment.
- Do not walk down headworks stairs unless exhaust fan is working or confined space entry procedures are implemented.
- Adequate hearing protection should be worn in noisy environments such as blower and pump rooms.

2.1.4 MAINTENANCE

Periodic Maintenance

Some components of the system require only periodic maintenance. Consult the manufacturer's O&M manual for a complete list and instructions on how to perform the maintenance. Be sure to follow all safety guidelines.

The tolerances between the pump's impeller and the pump's volute should be checked periodically. Consult the manufacturer's manual for the correct procedure. Check the bearing condition by listening for unusual noises, checking for vibration, and checking temperature. The operating sequence of the pumps should be changed weekly to avoid excessive wear on a single pump.

At the headworks facility, the mechanical components of the bar screen should be greased periodically. The cogwheels and pin racks of the bar screen should be kept greased at all times. Built up scum, grease, and other materials should be removed and the areas hosed down. Check the location of the limit switches on the bar screen. Limit switches should be located as originally set. Check the oil level in the screenings press. Lubricate if needed. Check the wear on the screw conveyor. Replace or repair all damaged parts. Touch up any nicks or scratches on the painted equipment. Inspect and lubricate the slide gates every 100 cycles of operation or when necessary. Lubricate the stem and clean the gate with plant water.

Plant staff has a maintenance program in place. This program should be updated with appropriate detailed information from the manufacturer's operation and maintenance manuals. Further revisions to the maintenance program should be made based on operation and maintenance experience.

2.2 – Aerated Grit Chamber

2.2.0 GENERAL PROCESS DESCRIPTION

The grit removal system serves to remove grit from the plant influent flow that could cause damage or excessive wear on downstream process equipment. Influent wastewater, plant drain flow which includes filter backwash water and centrifuge concentrate, and secondary scum are conveyed into the aerated grit chamber influent channel through the 16-inch RWW and the 6-inch SC pipelines. From the influent channel, wastewater flows under a baffle and enters the aerated grit chamber. Grit removed is pumped by air pumps to a grit classifier. In the grit classifier, grit is dewatered and conveyed into a dumpster for disposal. Excess water from the grit classifier is discharged to the plant drain system.

After flowing through the grit chamber, flow is directed to the influent flow splitter box on the East end of the Oxidation ditches via a 24-inch SI pipeline. If the influent flow exceeds the flow capacity of the grit chamber or the grit chamber needs to be taken out of service, the grit chamber can be bypassed and flow can be diverted through a influent channel mounted slide gate into a 24-inch diameter bypass pipe.

2.2.1 STARTUP/SHUTDOWN PROCEDURES

The following is a brief description of the Aerated Grit Chamber process startup and shutdown procedures. Refer to the equipment O&M manuals for specific information regarding lubrication and specific equipment checks.

Startup

Grit System

Pre-startup Safety Checks

1. Verify that all equipment is off and locked out.
2. Lube equipment as required by the manufacturers.
3. Check that all anchor bolts and fastening devices are secure.
4. Check that all drive assembly components and guards are in place and are properly aligned and tensioned.
5. Verify the grit chamber, aeration blowers, solenoid valves and grit classifier are available for service.
6. Verify that alarm systems are ready.
7. Perform all manufacturers' recommended pre-startup procedures. Refer to the manufacturer's operation and maintenance manual.

Startup Procedures

1. Remove lockout tags.
2. Verify that power is on for each piece of equipment.
3. Start the grit blowers at the MCC or at the blowers in the Headworks Building. Adjust the throttling air valve to the diffusers to obtain a gentle roll in grit basin.
4. Place grit classifier in hand and start. Verify proper operation.
5. Stop classifier and place in auto mode.
6. Place solenoid valves in Manual. Verify proper operation of the valves.

7. Place in Solenoid valves auto mode.

Shutdown

Grit System

1. Open bypass channel mounted slide gate and close inlet sluice gate to grit chamber.
2. Let air lift pumps run until hoppers have been emptied of grit.
3. Stop and lockout the blowers to be removed from service.
4. Stop solenoid valves to air lift pumps to be removed from service.
5. Stop and lockout classifier to be removed from service.

2.2.2 ALARM CONDITIONS

This section describes the alarm conditions that can occur during operation of the aerated grit system. The alarms provide for the operational surveillance of the facilities, alerting operators to abnormal conditions. The alarms are monitored by the plant SCADA system. Alarm conditions are annunciated at the Local Control Panel, MCC, and at the OIS system. Consult the manufacturer's O&M manual for more detailed responses to alarm conditions.

Operations Strategy

When an alarm occurs, the operator acknowledges the alarm at the Local Control Panel or OIS, examines the process condition and takes corrective action. The operator then proceeds to the equipment or area originating the alarm. At the equipment (assuming that it is a safe location) that originated the alarm, the operator assesses the problem and determines the actions required. The manufacturer's O&M manual provides specific trouble-shooting procedures.

The following section lists the alarm indications and possible causes.

Grit Removal

Indication: Grit Chamber Blower Failure
Action:
1. Acknowledge the alarm at the OIS.
2. Remove the unit from service and place the standby unit in service.
3. Make provisions to have failed blower inspected by electrical technician.

Indication: Grit Pump Solenoid Valve Failure
Action:
1. Acknowledge the alarm at the OIS.
2. Check and reset the pump once.
3. Check the discharge pressure of the pump and verify that fluid is being pumped.

Indication: Grit Classifier Failure and High Water Level in Classifier
Action:
1. Acknowledge the alarm at the OIS.
2. Automatic shut down of air lift pumps Solenoid valves if high level switch 01-LSH-084 is activated.
3. Stop and check the classifier. If a foreign object is lodged

inside, remove.

4. Reset and restart the classifier. If the problem is not resolved, refer to the manufacturer's operation and maintenance manual.

2.2.3 SAFETY

These safety instructions are provided as general guidelines only for operation of the headworks facilities. They are not intended to replace existing plant safety instructions and procedures.

- Always lockout any equipment before service or repair. Notify other operators of any unit malfunction and that you intend to repair it. Follow established safety procedures before and during the work.
- Safety precautions should be taken whenever plant operations personnel are working around the headworks. All equipment is capable of remote control operation and may start at any time. Prior to servicing or inspection, all equipment controls should be stopped and locked out locally.
- Keep combustible gas detectors in good working order to prevent a hazardous environment.
- Adequate hearing protection should be worn in noisy environments such as blower and pump rooms.

2.2.4 MAINTENANCE

Facility staff has a maintenance program in place. This program should be updated with appropriate detailed information from the manufacturer's operation and maintenance manuals. Further revisions to the maintenance program should be made based on operation and maintenance experience.

2.3 – Oxidation Ditches

2.3.0 GENERAL PROCESS DESCRIPTION

The California Men's Colony (CMC) Wastewater Treatment Facility (WWTF) uses a biological treatment process and biological nutrient removal (BNR) process to treat wastewater. In a biological process, oxygen is dissolved into the wastewater to drive the treatment process. Microbial growth is initiated in the system which feeds upon the organic material in the wastewater. Nutrients, mainly organic nitrogen, are removed from the wastewater through the BNR processes of nitrification and denitrification.

The oxidation ditch and secondary clarifiers are the major unit processes responsible for removing the biochemical oxygen demand (BOD), total suspended solids (TSS), and nutrients from the wastewater.

The biological treatment operation of the oxidation ditch depends upon a population of organisms in the oxidation ditch which convert the organic material in the wastewater to new cells, and the subsequent settling and removal of the organisms in the secondary clarifiers. Each part of the process must operate well to achieve good treatment.

The population of microorganisms, referred to as mixed liquor, is maintained in the oxidation ditch and is responsible for the wastewater treatment and nutrient removal. These microorganisms feed on the soluble and suspended matter in the wastewater. Organic material is used to provide energy for the organisms and create new cells. Nutrients are also required for new microorganism growth. Nitrogen and phosphorus are primarily required along with other nutrients in smaller or trace quantities.

Mixed liquor organisms are "aerobic" organisms, requiring the presence of oxygen for life. Oxygen is introduced in the aerobic portion of the oxidation ditch by the aerators. The aerators agitate the surface of the water, thereby entraining air into the water. Agitation also insures proper mixing, while the rotation of the aerators maintains velocity in the ditch channels. The aerobic basin treats the organic material in the wastewater and is also designed to provide nearly complete oxidation of the influent ammonia (nitrification).

Adjustable weir gates allow nitrified mixed liquor (Mixed Liquor Return = MLR) from the aerobic zone to the anoxic zone where the microorganisms in the RAS metabolize the organic material in the incoming wastewater (SI) using the nitrate in the recycled mixed liquor as a source of oxygen. The result is denitrification and the release of nitrogen gas during agitation in the aerobic basin. The nitrified aerobic basin MLR continuously bleeds from the aerobic zone back through the adjustable weir gates into the anoxic zone to maintain the process.

2.3.1 STARTUP/SHUTDOWN PROCEDURES

The following is a brief description of the Oxidation Ditches process startup and shutdown procedures. Refer to the equipment O&M manuals for specific information regarding lubrication and specific equipment checks.

Startup

1. Verify that the drain gates and valves are closed, and the ditch is ready to receive water.
2. Set the overflow weirs at their desired level.
3. Open the 24-inch sluice gates at the oxidation ditch influent box.
4. Fill the ditch with raw wastewater and MLSS from the existing aeration basin. When the ditch is half full, start the RAS pump flow.
5. Start the aerators and mixers. Verify power is on at the local control panel, and the motors are not locked out.

Aerating the wastewater starts the activated sludge process. The microorganisms that have now established themselves in the ditch have food and are now being supplied with oxygen. This will allow the organism population to begin to increase. Pumped activated sludge from a neighboring treatment plant delivered by truck to assist in starting the process.
After two or three hours of aeration, the dissolved oxygen of the oxidation ditch should be checked to determine if sufficient air is being supplied. DO should be checked near each aerator. Oxygen must be available for the organisms throughout the tank. If the DO is less than 0.5 mg/L anywhere, increase the submergence or speed of the aerator. If the DO is greater than 1.5 mg/L everywhere, the submergence or speed may be decreased, but not to the point where the tank would stop mixing. There will probably be an excess amount of DO at first, due to the limited number of organisms initially present to use it.
After a biological culture of organisms is established in the oxidation ditch, sufficient oxygen must be supplied to overcome the following demands:

- DO usually is low in both influent wastewater and return sludge to the aerator.
- Influent wastewater may be septic, thus creating an immediate oxygen demand.
- Organisms in the presence of sufficient food create a high demand for oxygen.

Collect a sample from the oxidation ditch on the third day after startup and run a 60 minute settleability test using a 1,000 ml graduated cylinder. A 2,000 ml cylinder with a 5-inch diameter can be used to obtain better results. Observe the sludge settling in the sample for approximately one hour. It will probably have the same color as the wastewater during the first few days. After a few minutes in the cylinder, very fine particles will start forming with a light buff color. The particles remain suspended, not settling, similar to fine particles of dust in a light beam. After an hour, a small amount of these particles may have settled to the bottom of the cylinder to a depth of 10 or 20 ml, but most are still in suspension. This indicates that you are making a start toward establishing a good condition in the ditch, but many more particles are needed for effective wastewater treatment.

During the fourth through tenth day of operation, the only controls applied to the system usually consist of maintaining DO concentrations in the system. Additional wastewater should be fed to the ditch during this period. The amount of "food" will depend upon the quantity of MLVSS built-up in the ditch. Add wastewater based on a food-to-microorganism ratio (F/M) of 0.08. Use return activated sludge system and clarifiers when adding wastewater.
A sampling program should be started in accordance with the laboratory to develop and record the necessary data required for future plant control.

Aeration of wastewater to maintain DO will require some time before settling will produce a clear liquid over the settled solids. Time is required for organisms to grow to the point, where there are sufficient numbers to perform the work needed. Usually within 48 to 96 hours of aeration, it should be noted that the settleable solids do not fall through the liquid quite so rapidly, but the liquid remaining above the solids is clearer.

A reasonably clear effluent should be produced by the tenth day. Solids buildup in the oxidation ditch should be closely checked using the 60-minute settleable solids test during the first week. Results of this test indicate the flocculating, settling, and compacting characteristics of the sludge. Suspended solids buildup is very slow at first, but increases as the waste removal efficiency improves. This buildup should be carefully measured and evaluated each day. If sufficient sludge is built-up to assure proper F/M, wastewater may be admitted to the ditch and treatment plant continuously.

Close observation of the suspended solids buildup and results from the 60-minute settleability test will indicate the solids growth rate, condition of solids in ditch, and how much sludge should be returned to ensure proper return of the organisms to the ditch. It will be necessary to return all of the activated sludge for 15 to 30 days or longer if the wastewater is weak.

Shutdown

1. Close the 24-inch sluice gate at the Oxidation Ditch Influent Structure.
2. Stop and lockout the mixers and aerators.
3. Using a portable pump or pumps, pump the ML from the ditch being emptied to the other ditch. There is a 6-inch plug valve connector at the south end of each ditch for this purpose. Do not open 6" Plug Valve unless portable pumps are in place and operational.
4. Wash down the interior of the structure as water level drops.

2.3.2 ALARM CONDITIONS

This section describes the alarm conditions that can occur during operation of the oxidation ditch. The alarms provide for operational surveillance of the facilities, alerting operators to abnormal conditions. Alarm conditions for the oxidation ditch are annunciated at either the OIS or the local control panel.

Operations Strategy

When an alarm occurs, the operator acknowledges the alarm at the LCP or OIS, examines the process condition at the OIS, and takes corrective action, if possible. The operator proceeds to the equipment or area originating the alarm (assuming it is a safe location). At the equipment, the operator assesses the problem and determines the corrective actions required.

The following lists descriptions of each alarm, its indication, possible causes, and suggested response actions.

Anoxic Mixer Motor Overload

Indication: A motor overload is indicated at the OIS.

Action:
1. Reset the motor at the LCP.
2. Check the motor for excessive torque on the system, vibration, unusual noise, or overheating of drive or gear box. Determine if rags or material have accumulated on the mixer.

Aerator or Mixer Motor High Temperature

Indication: High temperature in motor windings indicated at the OIS.

Action:
1. Reset the alarm at the OIS.
2. Determine if motor is jammed or stopped accidentally.

Low Oil Pressure - Aerator

Indication: Low pressure (<7 psi) in the gear reducer indicated at the OIS.

Action:
1. Reset the alarm at the OIS.
2. Check oil level in gear box.

High/Low Dissolved Oxygen

Indication: Low dissolved oxygen concentration in the oxidation ditch indicated at the OIS.

Action:
1. Determine if the aerators are operating as required.
2. Activate an additional aerator or change operating aerator speed.

2.3.3 PERFORMANCE EVALUATION

Operation of an oxidation ditch plant can be controlled and adjusted with the help of a few simple tests, some general observations, and an understanding of the meaning of this information.

The following section will include both a narrative on observations and a discussion on potential problems encountered.

General observations of the plant are important to help determine whether or not the oxidation ditch is operating as intended. These observations include color of the liquid in the aeration chamber, odor on the plant site, and clarity of the aeration basin and final clarifier surface. Lab tests are important in helping the plant run well include: settleable solids test for both aeration basin and the final clarifier effluent, dissolved oxygen concentration and profile in the aeration basin, mixed liquor suspended solids concentration in the aeration basin, and pH. A brief discussion of each test is included below.

Color

The color of the mixed liquor in the oxidation ditch should be observed daily. For a properly running oxidation ditch, mixed liquor should have a medium to rich dark brown color. If the plant, following proper start-up, changes color from a dark brown to a light brown and the solids appear thinner than before, the sludge wasting rate may be too high which will cause a reduction in plant efficiency. By decreasing or halting sludge wasting before the color lightens too much, you can insure that the plant effluent quality will not deteriorate.

During plant start-up, a dark gray color of the aeration basin contents may be seen. A dark gray color normally indicates a lack of bacterial build up in the mixed liquor. If this condition persists for more than several days, check the RAS system for proper operation.

If the mixed liquor becomes black, the oxidation ditch basin is not receiving enough oxygen and has gone "anaerobic." The oxygen input to the ditch must be increased to eliminate the black color and return the process to normal aerobic operations.

Odor

When the oxidation ditch is operating properly, there should be little or no odor. Odor, if detected, should be an earthy smell. If an odor other than this is present, the operator should check and determine the cause. Odor similar to rotten eggs indicates that the aeration basin may have gone anaerobic, requiring more oxygen.

Odor may also be a sign of poor housekeeping. Grease and solids buildup on the edge of the oxidation ditch will go anaerobic and cause foul odors. With an oxidation ditch, odors are more often caused by poor housekeeping than poor operation.

Clarity

Freedom of the surface of the oxidation ditch from foam buildup and the clarity of the secondary clarifier water surface are two good indications of a properly operating oxidation ditch.

Foam buildup on the oxidation ditch, is caused by insufficient or too many mixed liquor solids in the aeration basin. Frequently foam buildup is seen during plant startup and will gradually disappear. Excess solids can result in the accumulation of foaming organisms that must be wasted out of the system.

Foam buildup can also occur if peak hydraulic loads cause "wash out" of the oxidation ditch contents. Solids should never be allowed to hydraulically wash out of the oxidation ditch and overload the secondary clarifiers.

Clarity of the effluent from the secondary clarifier discharged over the clarifier weirs is the best indication of excellent plant performance. A very clear effluent shows the plant is achieving excellent removal efficiency. A cloudy effluent often indicates a problem with the plant.

Problems that might occur which will affect the plant's performance will be either mechanical or process oriented. Each is discussed below. When a major change is contemplated, first review the plant data. Next, make only one major change at a time. If two changes are made, the operator will not know which or if both changes provided the corrective action. When a change is made, give the system at least one week (two, if possible) before attempting another change or modification. Do not make changes too fast.

Mechanical

The major mechanical problem that might occur is failure of the Aerators. A preventive maintenance program must be strictly followed to ensure maximum life and trouble-free operation.

A source of mechanical breakdown within the aerator assembly may occur at the motor, impeller, or gear reducer. This unit should be checked on a daily basis to assure that there is little or no oil leakage. Oil level should be examined and maintained at the manufacturer's

level. Low oil level is indicative of oil leakage and should be corrected. Oil should be changed as recommended in the Manufacturer's O&M Manual.

Performance

If the desired quality of the plant effluent is not achieved, the operator must determine what factor or factors have changed to upset the plant performance and reduce efficiency.

Important factors that could have changed include the following.

1. Lower or higher BOD load applied to the ditch (influent load from the Headworks).
2. More difficult to treat wastes have adversely changed influent characteristics.
3. Unsuitable mixed liquor suspended solids concentration in the ditch (too high or too low).
4. Lower or higher rate of wasting activated sludge.
5. Unsuitable rate of returning sludge to the ditch could adversely influence mixed liquor suspended solids.
6. Gradually increasing flow over one year.
7. Dropping oxygen concentration in the ditch below desirable levels.
   Examination of plant records should reveal the items, which have changed that could have upset the treatment process.
   If the plant becomes upset, the first action before making any changes is to check the plant data for at least three previous weeks. Ask the following questions to help identify the problem.
8. Have any changes been made to other plant units?
9. Have the daily flows and waste concentrations increased or decreased?
10. Has temperature of the influent changed in a significant amount?
11. Has the sampling program been consistent?

Most of the time, plant upset is due to some in-plant problem and not the influent raw wastewater, unless the plant is frequently overloaded.

Temperature

The activated sludge system is influenced by temperature changes in spring and fall. During the summer, the activated sludge system may operate satisfactorily in a certain loading range and aeration requirements, but in winter, the best loading ranges and aeration requirements change. Generally, the ditch requires less oxygen and more solids in winter. Usually, a temperature change is not significant unless it raises or lowers the temperature more than 10 degrees Fahrenheit.

Temperature is an important factor in oxidation relative to sludge accumulation. A high temperature produces a rapid microorganism growth and waste oxidation. Low temperature cause a slower growth rate and more waste storage in the organism cell with less oxidation. Therefore, a larger net sludge production will result with lower biological activity, and the process will have a tendency to produce a thinner sludge during cold months.

Sampling

Data on system performance can be greatly affected by changes in a sampling program. If improper sampling locations or laboratory procedures are used, lab results can vary considerably. When the lab data varies widely from one day to the next, check sampling location, time, and lab procedures for errors and inconsistencies.

Sludge Bulking

Bulking is the term applied to the condition in which the mixed liquor solids tend to show a very slow settling rate and compact to a limited extent in the secondary clarifier. The liquid that does separate from the solids usually produces a crystal clear, high-quality effluent, but generally there is not enough time for complete removal of the solids in the clarifier. The sludge blanket in the clarifier becomes deeper and rises during peak flow to overflow the weirs and is discharged in the effluent. Thus, excellent supernatant during low flow can cause confusion when evaluating this problem.

Bulking may be associated with production of a jelly-like, water-logged (hydrated) sludge that has a very low sludge density, or by a filamentous growth that may grow from one floc mass to another and act as stay rods to prevent compaction of the sludge particles and produce poor settling characteristics.

Low pH, low D.O., and low influent nitrogen and phosphorus concentrations have been related to bulking. High F/M loading rates (low MCRT) is the major item that will produce bulking consistently. Organisms that grow rapidly need to spread and will not clump or form a floc mass until growth rates decrease. It is difficult to retain enough low-density (light) sludge to decrease the food-to-organism load ratio (or increase MCRT) without chemical flocculation or other methods to increase the sludge density (weight). A rain may provide enough silt to favor increased sludge density. Low loading during weekends may help. Some of the polyelectrolyte flocculant aids, (polymer) are very effective in controlling a bulking activated sludge. If it is possible, bulking may be reduced by decreasing the load to the ditch until the sludge becomes sufficiently oxidized to flocculate.

The main objective of most bulking control procedures is to increase MCRT or decrease the ratio of influent waste (food) load added per day per unit of mixed liquor volatile solids in the ditch (decrease F/M). Aluminum sulfate [Al2(SO4) 14H2O], iron as ferric chloride (FeCl2) or ferric sulfate [Fe2 (SO4)3 3H20], added as a flocculent with alkaline (lime) addition to prevent low pH are good methods for holding solids under aeration.

Chlorination may be an effective cure because the bacteria responsible for bulking are more susceptible to chlorine effects than the organisms that are needed to treat the waste. Effluent turbidity may increase for several days after an application of chlorine, and bulking is likely to return if the solids retention problem is not corrected. The amount of chlorine to apply to the system may be approximated by the expression:

Lbs Cl2 per day = SVI x Rq x Rs x 8.34 x 10-5

Where

SVI = sludge volume index
Rq = RAS rate mgd
Rs = RAS suspended solids mg/L

Occurrences of filamentous growth may be caused by incorrect MCRT or nutritional imbalance, such as a shortage of nitrogen or phosphorus, or abundance of carbon. If filamentous growths are allowed to become well established, they create a difficult problem to overcome. Control may be achieved by adjusting the MCRT or F/M, depending on the type of sludge causing the problem: consult a text or reference for remedial action.

Septic Sludge

Septic sludge may be produced when any type of sludge remains too long without oxygen. It is likely to cause a foul odor, rise slowly, and sometimes rise in clumps.

Septic sludge may occur in poorly designed or constructed hopper wells, channels, or pipe systems. Septic sludge deposits also may develop on the floor of the ditch due to insufficient turbulence keeping the contents from being completely mixed.

To effectively control septic sludge, aerators must thoroughly mix the ditch contents and sludge must be returned rapidly.

Sludge going septic in the clarifier may develop from four causes.

1. Return sludge rate too low, thus holding the solids in the clarifier too long and allowing them to become septic.
2. Collection mechanism turned off, thus the sludge is not being moved to the drawoff hopper.
3. Return sludge pipe plugged or a valve closed.
4 Pumps malfunctioning or inoperative.

Toxic Substances

Toxicity causes inhibition or death of working organisms which produces system and effluent upsets. The operator has limited control over the cause. Sludge wasting should be stopped immediately and all available solids returned to the ditch. Influent wastewater containing toxins should be diverted past the ditch and temporarily stored. Toxic materials such as heavy metals, acids, insecticides, and pesticides should never be dumped into sewer system.

Rising Sludge

Rising sludge is not to be confused with bulking. The sludge settles and compacts satisfactorily on the bottom of the basin, but after settling, it rises to the top of the secondary tank in patches or small particles the size of a pea with tiny bubbles attached. This is usually accompanied by a fine scum or froth (brown in color) on the surface of the aeration and secondary tanks.

Rising sludge is caused by incomplete denitrification in the oxidation ditch or septicity from too long a detention time in the clarifier. The clarifier is equipped with scum baffles and skimmers to prevent these solids from escaping in the plant effluent.

Frothing

Ditch frothing has been a problem for some plants. There have been many theories presented on the cause such as surfactants (detergents), polysaccharides, and over-aeration. Whatever the cause, there is a definite relationship between froth build-up on the ditch and the amount of suspended solids in the mixed liquor and air supply to the ditch. For control:

1. Maintain higher mixed liquor suspended solids concentrations.
2. Reduce the number of aerators in service during periods of low flow while still maintaining D.O.

Short-Circuiting

This situation occurs in activated sludge systems and is often not detected. Wastewater enters the mixed liquor and streamlines directly to the effluent weir. Obvious results are total bypass of the aeration and poor effluent. Short-circuiting is not easily detected without use of a dye test. Causes of short-circuiting are density and temperature variation. During winter months, the oxidation ditch temperatures may drop slightly (10 degrees F) allowing warmer water effluent to short circuit. Remedies for this problem are mechanical. Baffles may be required to mitigate the problem.

2.3.4 TROUBLESHOOTING

Process

	Problem	Solution	Reference*
1.	**Sludge Bulking**		
	MLSS have a slow settling rate and compacts to a limited extent. Sludge blanket in the clarifier becomes deeper and rises to overflow the weirs and is discharged with the effluent.	Increase aeration. Decrease WAS rate. Increase F/M. Increase RAS rate.	a. p. 7 – 86 b. p. 254 c. p. 97 f. p. I – 13, II – 24, II – 29, II – 36, II – 82, II – 83
2.	**Septic Sludge**		
	Septic sludge is likely to cause a foul odor, rises slowly, and sometimes rises in clumps. Increase aeration. Ensure adequate mixing in ditch.	Increase RAS rate.	a. p. 7 – 88 f. p. I – 4
3.	**Rising Sludge**		
	Sludge settles and compacts satisfactorily on the bottom of the clarifier, but after settling it rises to the top of the clarifier in patches or small particles the size of a pea.	Increase RAS rate. Increase WAS rate.	a. p. 7 – 89 b. p. 256 f. p. I – 16
4.	**Frothing**		
	Excessive Foam on ditch.	Decrease aeration. Utilize defoaming agents. Reduce WAS rates.	a. p. 7 – 89 b. p. 257 c. p. 68

	Problem	Solution	Reference*
5.	**Difficulty in Maintaining Balanced Mixed Liquor and D.O. in Ditch**		
	Intermittent sludge bulking with loss of sludge blanket in secondary clarifier. Basin contents are dark in color.	Reduce WAS rates. Increase RAS rates. Lower D.O. concentrations occurring during changes in plant flow are an indication of excessive loading of ditch. Increase aeration.	f. p. I – 8
6.	**Unable to Maintain Balanced Food/Microorganism Ratio in Ditch**		
	Fluctuations in the SVI.	Select and operate activated sludge system by either solids retention time or food/microorganism ratio.	e. p. 69
7.	**Erratic SVI**		
	Pin floc visible in the clarifier overflow. Poor settling characteristics of mixed liquor.	Regulate wasting to decrease suspended solids in mixed liquor.	d. p. 139 e. p. 65
8.	**Deflocculation**		
	Breakup of sludge into very small particles that settle poorly. Turbid effluent with a SVI which increases and then remains constant after several days.	Reduce excess shear caused by hydraulic turbulence	e. p. 138
9.	**Straggler Floc**		
	Small, almost, transparent light, fluffy buoyant sludge particles rising to the surface near effluent weirs. Final effluent is otherwise exceptionally clear.	Decrease WAS rate moderately to increase sludge age.	d. p. 139 f. p. I - 21, II - 97, & II - 36

*References

a. "Operating Wastewater Treatment Plants" by Ken Kerri
b. Texas Manual of Wastewater Operations
c. New York Manual of Operations
d. WEF "Operation of Wastewater Treatment Plants" MOP 11
e. EPA Procedural Manual for Evaluating the Performance of Wastewater Treatment Plants.
f. EPA Process control Manual for Aerobic Biological Wastewater Treatment Facilities, March 1997.

2.3.5 SAFETY

These safety instructions are provided as general guidelines only for operation of the oxidation ditch. They are not intended to replace existing plant safety instructions and procedures.

- Always lockout any equipment before service or repair. Notify other operators of any unit malfunction and that you intend to repair it. Follow established safety procedures before and during the work.

- Safety precautions should be taken whenever plant operations personnel are working around the oxidation ditch. Aeration equipment is capable of remote control operation and may start at any time. Before servicing or inspection, all equipment controls should be stopped and locked out locally.
- Adequate hearing protection should be worn in noisy environments such as blower and pump rooms.

2.3.6 MAINTENANCE

The plant should update any current maintenance procedures with the appropriate detailed information from the manufacturer's O&M manuals. The procedures and maintenance schedules recommended by the manufacturer's publications must be followed to maintain complete warranty coverage of the facility equipment and ancillary equipment. After the warranty period, revisions to the maintenance schedules should be made based on the operation and maintenance experience and approved by a designated manager. The revisions should address the frequency of mechanical inspection based on the amount of wear observed during the warranty period.

2.4 – Secondary Clarification

2.4.0 GENERAL PROCESS DESCRIPTION

Mixed liquor (ML) from the oxidation ditch flows in a 36-inch diameter pipe to the mixed liquor splitter box, where it is distributed to the two secondary clarifiers. In the Secondary Clarifier Flow Split Structure, the ML is evenly split through the use of weirs to the two secondary clarifiers via 24-inch lines.

The secondary clarifiers perform several functions simultaneously: clarification; settling; thickening; and solids removal as part of the secondary treatment process. Sludge that accumulates on the bottom of the clarifier flows by gravity to the RAS/WAS Pump Station. Some of the sludge is returned to the oxidation ditch process, while some of the sludge is wasted to the centrifuges in the Biosolids Dewatering Building.

2.4.1 Startup/Shutdown Procedures

The following is a brief description of the secondary clarification process startup and shutdown procedures. Refer to the equipment O&M manuals for specific information regarding lubrication and specific equipment checks.

Startup

Mixed Liquor Splitter Box

1. Check that the flow split structure is free of debris and that personnel are not working in the structure.

Secondary Clarifiers

2. Verify sludge collector mechanism has been stopped and locked out.
3. Lubricate collector mechanism as necessary per manufacturer's recommendations.
4. Remove any accumulated debris from basin, sludge collector mechanism, and effluent launder. Do not start sludge collector with sludge or debris in basin.
5. Start scum sprayers and adjust hose bibs to refill the basins with plant water.
6. Start sludge collector mechanism when the basin is approximately 3/4 full.
7. Observe sludge collector mechanism for at least two complete revolutions or about 40 minutes. Any stoppage or vibration should be corrected prior to returning basin to service.

Scum Collection

8. Lubricate scum skimmer mechanism as necessary per manufacturer's recommendations.
9. Verify scum hopper is clean and unplugged.
10. Open scum sprayer header valves over the basin and in the scum trough and align nozzles for scum collection.

Shutdown

Secondary Clarifiers

11. Shut 24-inch ML sluice gate at the mixed liquor splitter box.
12. Allow sludge collector mechanism to operate for three to four hours, while drawing sludge off the bottom of the basin.
13. The RAS/WAS pumps should be used to drain the wastewater above the sloped sludge hopper area. A portable pump will be required to drain the sloped area where the RAS/WAS pumps stop pumping.
14. When sludge from the bottom of the basin has been removed, stop and lockout sludge collector mechanism.

Sludge Collection

15. As the basin is dewatered, hose off the sludge collection mechanism, or scraper flights, and wear strips. Identify worn or broken components.
16. Switch the drive off. Lockout and tagout equipment.

2.4.2 ALARM CONDITIONS

This section describes alarm conditions that can occur during operation of the secondary clarifiers. The alarms provide for the operational surveillance of the facilities, alerting operators to abnormal conditions. Alarm conditions are annunciated either at the OIS, and/or at the local control panels (LCPs).

Operations Strategy

When an alarm occurs, the Operator acknowledges the alarm at the LCP, or OIS examines the process condition on the OIS, or LCP, if possible. Then operator proceeds to the equipment or area originating the alarm (assuming that it is a safe location). At the equipment, the operator assesses the problem and determines the corrective actions required. Observe the established safety procedures during all operations, including operation under emergency conditions.

The following lists descriptions of each alarm, its indication, possible causes, and suggested response actions.

Sludge Collector and Scum Pump Motor Overload Alarm

Indication: A motor overload alarm is indicated at the OIS.

Action:
1. Check and reset the motor.
2. Reset the alarm at the LCP.
3. Check for excessive torque on the system, vibration, unusual noise, or overheating of drive or gear box.
4. Increase sludge flow to reduce inventory in clarifier.

Sludge Collector 90 or 100 percent High Torque Alarms

Indication: Sludge collector mechanism high or high-high torque switch tripped is indicated at the OIS and LCP. The high-high toque switch will shutdown the drive motor, and turn on the failure beacon at the LCP.

Action:
1. Acknowledge the alarm at the OIS.
2. Check torque reading on the collector mechanism.
3. Check assembly and shear pin for damage.

4. Check for excessive vibration, unusual noise, or overheating of drive or gear box.
5. Increase sludge pumping to reduce inventory in the clarifier.

Sludge Collector Fail Alarm/Shear Pin Broken Alarm

Indication: A limit switch trip signal alarm is indicated at the OIS and LCP for "Shear Pin Broken" and a beacon at the LCP. This indicates failure of the shear pin.

Action:
1. Acknowledge the alarm at the OIS.
2. Stop and lockout collector mechanisms.
3. Check collector mechanism for free movement.
4. If required, replace collector shear pin.
5. Check limit switch for proper operation.
6. Restart collector mechanism.
7. Check for excessive torque on the system. If required, increase sludge flow to reduce inventory in the clarifier.

Scum Pump Motor Stator High Temperature Discharge Pressure and Moisture Detection Alarm

Indication: Overheating of pump motor or leakage in motor casing indicated at the OIS.

Action:
1. Remove pump from service.
2. Insert standby pump into sequence.
3. Remove pump from wet well to determine if impeller is clogged and motor casing integrity.

Wet Well High-High Water Level (scum pumps)

Indication: High-High water level in the wet well indicated at the OIS.

Action:
1. Check operation of pumps.

Wet Well Low-Low Water Level (scum pumps)

Indication: Low water in the wet well indicated at the OIS.

Action:
1. Determine if pumps failed to stop.

2.4.3 SAFETY

These safety instructions are provided as general guidelines only for operation of the secondary clarifiers. They are not intended to replace existing plant safety instructions and procedures.

- Always lockout any equipment before service or repair. Notify other operators of any unit malfunction and that you intend to repair it. Follow established safety procedures before and during the work.
- Safety precautions should be taken whenever plant operations personnel are working around the secondary clarifiers. All equipment is capable of remote control operation and may start at any time. Prior to servicing or inspection, all equipment controls should be stopped and locked out locally.
- Adequate hearing protection should be worn in noisy environments such as blower and pump rooms.

2.4.4 MAINTENANCE

The facility should update any current maintenance procedures with the appropriate detailed information from the manufacturer's O&M manuals. The procedures and maintenance schedules recommended by the manufacturer's publications must be followed to maintain complete warranty coverage of the facility equipment and ancillary equipment. After the warranty period, revisions to the maintenance schedules should be made based on the operation and maintenance experience and approved by a designated manager. The revisions should address the frequency of mechanical inspection based on the amount of wear observed during the warranty period.

2.5 – Tertiary Treatment

2.5.0 GENERAL PROCESS DESCRIPTION

After secondary clarification, the plant provides sand filtration to the liquid stream. Suspended solids that remain in the process water after secondary clarification can contain enough nutrients within the cell walls to cause violations of the effluent discharge permit limits. Chemical additions, such as polymer, are used to enhance the coagulation and flocculation of these minute particles. Once coagulated and flocculated, the particles can be effectively filtered out leaving an effluent relatively free from suspended solids and turbidity.

2.5.1 Startup/Shutdown Procedures

The following is a brief description of the tertiary treatment process startup and shutdown procedures. Refer to the equipment O&M manuals for specific information regarding lubrication and specific equipment checks.

Startup

Polymer System

1. Start chemical metering pump in local control. Set stroke so pump will operate at 30 percent speed or higher in automatic.
2. Perform a calibrated pump down to verify proper operation.
3. Check pump discharge pressure for high reading or excessive movement.
4. Check high pressure relief valve for sound.
5. Inspect the basin and verify that all equipment and personnel are clear of the area and drain valves are closed.
6. Verify chemical addition setpoints are adequate for treatment.
7. Open slide gates and allow flow to enter the mixer channel.
8. Set chemical metering pump in automatic.
9. When water level rises three feet above blades, start the mixer. Check operation of mixers for excessive noise or vibration.

Flocculation Basin

10. Inspect the basin and verify that all debris, equipment, and personnel are clear of the area and drain valves are closed.

Tertiary Filters

11. Check the air compressor set points. Adjust as necessary.
12. Check the rotameter air settings. Adjust as necessary.
13. Collect influent and effluent samples and measure turbidity. Adjust chemical dosages as necessary.

Shutdown

Polymer System

14. Stop and lockout chemical metering pump.
15. Close suction and discharge valves.
16. Turn off coagulant flash mixer if in operation.
17. If required, flush chemical metering pipes.

Flocculation Basin

18. Stop and lockout chemical metering pumps.

19. Close suction and discharge valves.
20. Turn off mixer.
21. If required, flush chemical metering pipes.

Tertiary Filters

22. Close 8-inch BFV influent filter valve.
23. If filter cell is to be drained, arrange for temporary pump to pump drained water to the closest plant drain manhole.
24. Shut down the air compressor serving the particular cell.

2.5.2 ALARM CONDITIONS

This section describes alarm conditions that can occur during the operation of the tertiary treatment facilities. The alarms provide for the operational surveillance of the facilities, alerting operators to abnormal conditions. Alarm conditions are annunciated at the OIS, MCCs, and / or local control panels (LCPs).

Operational Strategy

When an alarm occurs, the operator acknowledges the alarm at the LCP, MCC or OIS, examines the process condition on the OIS, LCP or MCC and takes corrective action. The operator then proceeds to the equipment or area originating the alarm. At the equipment or area originating the alarm (assuming that it is a safe location), the operator assesses the problem and determines the actions required. The established plant safety procedures are to be observed during all operations, including operation under emergency conditions.

The following sections contain descriptions of each alarm, its indication, possible causes, and suggested response actions.

Polymer Flash Mix

Chemical Metering Pump Fail Alarm (In Biosolids Building)

Indication: An overload alarm is indicated at the OIS.

Action:
1. Acknowledge the alarm.
2. Backup pump should have started automatically.
3. Check and reset the motor.
4. Check for excessive vibration, unusual noise, or overheating of drive or gearbox.
5. If pump fails again, stop and lockout the motor. Investigate cause for failure.

Coagulant Flash Metering Pump High Pressure Alarm

Indication: A high pressure alarm is indicated at the OIS. Pump will not run.

Action:
1. Acknowledge the alarm at the OIS.
2. Check discharge valve alignment.
3. Check for activation of high pressure switch.
4. Reset the pump. Check operating pressures.
5. Investigate for plugged line.

Coagulant Flash Mixer Fail Alarm

Indication: A fail alarm is indicated at the OIS for the mixer.

Action:
1. Acknowledge the alarm at the OIS.

2. Stop and lockout the mixer.
3. Check the mixer for free movement.
4. Attempt to restart the mixer once.
5. If the mixer fails again, increase dosages by 10 percent to compensate for poor mixing.

Tertiary Filters

Low Air Flow Alarm

Indication: A low backwash airflow alarm is indicated at the PLC.

Action:
1. Acknowledge the alarm.
2. Check rotameters and pressure regulators. Adjust as necessary.
3. Reset alarm at OIS

Air Compressor Failure Alarm

Indication: A compressor fail alarm is indicated at the OIS.

Action:
1. Acknowledge the alarm at the OIS.
2. Attempt to restart the air compressor once.
3. If the compressor fails to start, stop and lockout the compressor.
4. Place spare compressor in service.
5. Make necessary repairs to compressor and return to service.

2.5.3 SAFETY

These safety instructions are provided as general guidelines only for operation of the tertiary treatment facilities. They are not intended to replace existing plant safety instructions and procedures.

- Always lockout any equipment before service or repair. Notify other operators of any unit malfunction and that you intend to repair it. Follow established safety procedures before and during the work.
- Safety precautions should be taken whenever plant operations personnel are working around the tertiary treatment facilities. All equipment is capable of remote control operation and may start at any time. Prior to servicing or inspection, all equipment controls should be stopped and locked out locally.
- Adequate hearing protection should be worn in noisy environments such as blower and pump rooms.

2.5.4 MAINTENANCE

The plant should update any current maintenance procedures with the appropriate detailed information from the manufacturer's O&M manuals. The procedures and maintenance schedules recommended by the manufacturer's publications must be followed to maintain complete warranty coverage of the facility equipment and ancillary equipment. After the warranty period, revisions to the maintenance schedules should be made based on the operation and maintenance experience and approved by a designated manager. The revisions should address the frequency of mechanical inspection based on the amount of wear observed during the warranty period.

2.6 – Chlorination And Dechlorination Systems

2.6.0 GENERAL PROCESS DESCRIPTION

Disinfection and dechlorination are the final liquid treatment processes at the California Men's Colony (CMC) Wastewater Treatment Facility (WWTF). Suspended solids that remain in the process water after tertiary filtration could have disease-causing microorganisms known as pathogens. Sodium Hypochlorite Solution (SHS), commonly known as industrial grade (12 to 15 percent solution) chlorine bleach, is the oxidizing agent utilized to disinfect the treated tertiary effluent. The chlorine compounds oxidize the organic material left in the treated tertiary effluent including microorganisms. Oxidation with SHS inactivates most pathogens. The chlorine contact basin detention time is long enough to ensure adequate contact between the chlorine and organic material in the water. Sampling to verify low coliform concentrations in the effluent indicates effective chlorination. SHS is also used on site at the secondary clarifiers, tertiary filters influent, oxidation ditch spray (future installation), and injection into the RAS/WAS pump discharge pipe.

Chlorine residual in the effluent can be toxic to aquatic organisms in the local aquatic environment. To prevent the chlorine residual from affecting the aquatic environment in Chorro Creek, the chlorine contact basin effluent is dosed with Sodium Bisulfite Solution (SBS). SBS is a dechlorinating agent that neutralizes the chlorine residual before the disinfected tertiary effluent is discharged to Chorro Creek. SBS reacts with the chlorine compounds in the water thereby removing the toxicity. The SBS system should be operated in a manner that ensures all the chlorine residual is neutralized prior to the tertiary effluent entering Chorro Creek.

At the end of each basin chlorinated effluent over flows fixed weirs to discharge in the reclaimed water pump wet well. TE which is not pumped to the Golf Course Storage Reservoir flows into the sodium bisulfate mixing box to be dechlorinated before flowing over the effluent Parshall Flume to the existing outfall via a recently constructed 16-inch TE pipeline.

2.6.1 Startup/Shutdown Procedures

The following is a brief description of the disinfection facilities startup and shutdown procedures. Refer to the equipment O&M manuals for specific information regarding lubrication and specific equipment checks.

Startup

Chlorination

1. Inspect the chemical tanks verifying that all debris, equipment and personnel are out of the tank and the drain and outlet valves are closed.
2. Fill the tank with water and allow it to sit for 24 hours. Check for tank for leaks by observing a drop in tank level or wet concrete.
3. Drain the tank to the drainage sump. Drain the secondary containment area with a portable pump. (No permanent pump is provided in the sump to protect it from the environment.)
4. Align tank valves to supply chemical metering pumps.
5. Load the chemical tank.
6. Perform normal operation checks.
7. Align suction and discharge valves to the chemical metering pumps for the

proper discharge location.
8. Vent air out of high spots.
9. Start chemical metering pump in local control.
10. Perform a calibrated pump down to verify proper operation.
11. Check pump discharge pressure for high reading
12. Inspect the basin and verify that all equipment and personnel are clear of the area and drain valves are closed.
13. Verify all chemical setpoints. Set dose at 1.5 times what would normally be expected.
14. Set chemical metering pumps in automatic.
15. Start flow to the sodium hypochlorite mixing box.
16. Collect influent and effluent samples and measure for chlorine residual. Adjust chemical dosage as necessary.

Dechlorination

1. Inspect the chemical tanks verifying that all debris, equipment, and personnel are out of the tank and the drain and outlet valves are closed.
2. Fill the tank with water and allow it to sit for 24 hours. Check for tank for leaks by observing a drop in tank level or wet concrete.
3. Drain the tank to the dewatering sump. Drain the dewatering sump by using a temporary portable pump.
4. Align tank valves to vent properly and supply chemical metering pumps.
5. Load the chemical tank.
6. Perform normal operation checks.
7. Align suction and discharge valves to the chemical metering pumps for the proper discharge location.
8. Vent air out of high spots.
9. Start chemical metering pump in local control.
10. Perform a calibrated pump down to verify proper operation.
11. Check pump discharge pressure for high reading or excessive movement.
12. Inspect the basin to verify that all debris, equipment, and personnel are clear of the area. Verify that all drain valves are closed.
13. Verify all chemical setpoints. Set dose at 1.5 times what would normally be expected.
14. Set pumps to operate in automatic.
15. Direct flow to the dechlorination application point.
16. Collect influent and effluent samples and measure for chlorine residual. Adjust chemical dosage as necessary.

Shutdown Procedure

Chlorination

CAUTION: Disinfection and dechlorination of the plant effluent before discharge to the creek is a permit requirement. Do not shut down chemical metering pumps unless other provisions have been made.

1. Close influent gates.
2. Stop SHS dosing.
3. Close metering pump suction and discharge valves.
4. Stop and lockout the pump.
5. If required, flush the chemical metering lines.
6. Close effluent gates and begin draining the tank with a portable pump. Drain the tank at a rate that does not cause a hydraulic overload to the

treatment plant.

7. As the basin is dewatered, hose off walls and equipment. Identify worn or broken equipment.

Dechlorination

CAUTION: Disinfection and dechlorination of the plant effluent before discharge to the creek is a permit requirement. Do not shut down chemical metering pumps unless other provisions have been made.

1. Close influent gates.
2. Stop SBS dosing.
3. Close metering pump suction and discharge valves.
4. Stop and lockout the pump.
5. If required, flush the chemical metering lines.
6. Close effluent gates and begin draining the tank with a portable pump. Drain the tank at a rate that does not cause a hydraulic overload to the treatment plant.
7. As the basin is dewatered, hose off walls and equipment. Identify worn or broken equipment.

2.6.2 ALARM CONDITIONS

This section describes alarm conditions that can occur during the operation of the disinfection facilities. The alarms provide for the operational surveillance of the facilities, alerting operators to abnormal conditions. Alarm conditions are annunciated through PLC / OIS and / or local control panels.

Operational Strategy

When an alarm occurs, the operator who acknowledges the alarm at the LCP or OIS examines the process condition on the LCP or OIS and takes corrective action. The operator then proceeds to the equipment area originating the alarm. At the equipment area (assuming it is a safe location) from which the alarm originated, the operator assesses the problem and determines the corrective actions to be taken. The established plant safety procedures are to be observed during all operations, including operating under emergency conditions.

The following sections contain descriptions of each alarm, its indication, possible causes, and suggested response actions.

Sample Pump Alarm

Indication: An overload alarm is indicated at the MCC and OIS.

Action:

1. Acknowledge the alarm at the OIS.
2. Check and reset the motor.
3. Check for excessive vibration, unusual noise, or overheating of drive or gear box.
4. If the pump fails again stop and lockout the motor. Change the process control set point to flow pacing. Collect grab samples for process control monitoring until the sample pump can be fixed.
5. If the pump will be out of service for longer than 24 hours switch off chlorine analyzer and remove buffer bottle.

Chemical Metering Pump Fail Alarm

Indication: An overload alarm is indicated at the OIS.

Action:
1. Acknowledge the alarm.
2. Backup pump should have started automatically.
3. Check and reset the motor.
4. Check for excessive vibration, unusual noise, or overheating of drive or gear box.
5. If the pump fails again stop and lockout the motor. and investigate reason for failure.

Chemical Metering Pump High Pressure Alarm

Indication: A high pressure alarm is indicated at the OIS. Pump will not run.

Action:
1. Acknowledge the alarm at the OIS.
2. Check discharge valve alignment.
3. Check for activation of high pressure switch.
4. Reset the pump, check operating pressures.
5. Investigate for plugged line

Containment Area High Level Alarm

Indication: A sump high level alarm is indicated at the OIS for the chemical area.

Action:
1. Acknowledge the alarm at the OIS.
2. Check level switch for proper operation and obstructions.
3. Check chemical area for leaks. Check liquid for contamination with chemicals.
4. Install portable pump and drain accordingly. Pump liquid to area approved by plant supervisor. If a chemical leak is evident, special truck disposal of chemicals may be required.
5. Reset the alarm at the OIS.

Tertiary Effluent Reclaimed Water Pumps

Indication: Reclaimed Water Pump Failure

Action:
1. Acknowledge the alarm at the LCP.
2. Reset and restart motor once.
3. If motor starts, reset alarm.
4. If unit will not run, remove from service. Switch standby pump to duty status.

Indication: Reclaimed Water Pump Failure / Discharge Pressure High

Action:
1. Acknowledge the alarm at the LCP.
2. Check MCC for trip condition.
3. Check for proper valve alignment.
4. Reset and Restart motor once.
5. If motor starts, reset alarm.
6. If unit will not run, remove from service. Switch standby pump to duty status.
7. Investigate discharge piping for blockages.

2.6.3 SAFETY

These safety instructions are provided as general guidelines only for operation of the disinfection facilities. They are not intended to replace existing plant safety instructions and procedures.

- Always lockout any equipment before service or repair. Notify other operators of any unit malfunction and that you intend to repair it. Follow established safety procedures before and during the work.
- Safety precautions should be taken whenever plant operations personnel are working around the disinfection facilities. All equipment is capable of remote control operation and may start at any time. Prior to servicing or inspection, all equipment controls should be stopped and locked out locally.
- Adequate hearing protection should be worn in noisy environments such as blower and pump rooms.

2.6.4 MAINTENANCE

The facility should update any current maintenance procedures with the appropriate detailed information from the manufacturer's O&M manuals. The procedures and maintenance schedules recommended by the manufacturer's publications must be followed to maintain complete warranty coverage of the facility equipment and ancillary equipment. After the warranty period, revisions to the maintenance schedules should be made based on the operation and maintenance experience and approved by a designated manager. The revisions should address the frequency of mechanical inspection based on the amount of wear observed during the warranty period.

2.7 – RAS/WAS Pump Station

2.7.0 GENERAL PROCESS DESCRIPTION

The function of the RAS/WAS pump station is to return activated sludge back to the influent of the oxidation ditches and waste portions of the activated sludge removed from the secondary clarifiers. RAS also increases the SRT in the activated sludge process. The collected sludge is still active, and a portion of the sludge, the RAS, is returned to the oxidation ditch to supply seed bacteria for the plant influent. The remainder of the sludge, the WAS, is wasted to the centrifuges for processing.

The RAS and WAS systems consist of one pumping system, including three centrifugal non-clog pumps. Each pump is driven by motors with variable frequency drives. Normally one or two pumps operate. However, in extra peak wet weather wastewater influent flows, the third pump can also be used to increase RAS flow. Sludge flows from the hoppers of the secondary clarifiers to the RAS/WAS Pump Station. Under favorable conditions, the bacteria in the RAS will feed on the organic nutrients and use the oxygen added by the aerators to grow and multiply. In the secondary clarifiers, the bacteria settle and are again removed by the RAS/WAS facilities.

Not all sludge is returned indefinitely to the oxidation ditch. Under normal operating conditions, the RAS/WAS system removes a similar total mass of sludge from the secondary process as is grown each day. WAS, which is sludge mass not required for the biological process, is pumped to the centrifuges from the RAS/WAS pumps. There is a 6- inch motorized plug valve (05-MOV-001) and 4-inch magnetic flow meter (05-FIT-117) used to control the amount of WAS flow sent to the centrifuges.

2.7.1 Startup/Shutdown Procedures

The following is a brief description of the disinfection facilities startup and shutdown procedures. Refer to the equipment O&M manuals for specific information regarding lubrication and specific equipment checks.

Startup

RAS/WAS System

1. Normally, startup of this system occurs simultaneously with mixed liquor introduction into a clarifier filled with water.
2. Check pump and LCP for Do Not Operate tags.
3. Bump pumps to verify rotation.
4. Verify proper operation of the sludge collection mechanisms.
5. Open pump suction and discharge valves.
6. Open flush valves to pressure gauges until air is bled.
7. Place pump into automatic mode.
8. Set flow set points for the RAS/WAS and verify the controller operation at the OIS.

Shutdown

RAS/WAS System

1. Close the RAS/WAS secondary sludge valves from each clarifier.
2. RAS/WAS pumps will stop automatically.
3. Isolate the RAS and WAS pumps.

4. Switch OFF the RAS and WAS pumps and post Do Not Operate lockout/tagout tags at the LCP, if required.

Warning: The RAS system should not be shutdown unless the activated sludge system is being shutdown. The activated sludge process will not function unless a constant supply of recycled cell mass is provided. This procedure should only be performed if absolutely required, as in the case of a line break.

2.7.2 ALARM CONDITIONS

This section describes alarm conditions that can occur during operation of the RAS/WAS systems. The alarms provide for operational surveillance of the pump station, alerting operators to abnormal conditions. Alarm conditions are annunciated either at the OIS, and/or at the LCPs.

Operations Strategy

When an alarm occurs, the Operator acknowledges the alarm at the LCP or OIS, examines the process condition on the OIS or LCP, and takes corrective action, if possible. Then operator proceeds to the equipment or area originating the alarm (assuming that it is a safe location). At the equipment, the operator assesses the problem and determines the corrective actions required. Observe the established safety procedures during all operations, including operation under emergency conditions.

The following lists descriptions of each alarm, its indication, possible causes, and suggested response actions.

Sludge (RAS/WAS) Pump Seal Water Fail Alarm or Temperature Switch High (TSH)

Indication: A seal water low flow alarm or TSH is indicated at the OIS. Pump will not run.

Action:
1. Acknowledge the alarm at the OIS.
2. Verify seal water flow or check pump motor for over heating.
3. Check flow switch for proper operation.
4. Reset the pump, check seal water flow rate and pressure.

VFD Fail

Indication: VFD failed to start or failed to operate indicated at the LCP and OIS.

Action:
1. Remove VFD from service.
2. Check owner's manual for troubleshooting procedures.

WAS Plug Valve Fail Alarm

Indication: Plug valve will not close or open.

Action:
1. Remove from service. Install standby spool piece or plug valve.
2. Determine if plug valve has any obstructions.
3. Consult plug valve operator's O&M manufacturer's manual.

2.7.3 SAFETY

These safety instructions are provided as general guidelines only for operation of the RAS/WAS pump station. They are not intended to replace existing plant safety instructions and procedures.

- Always lockout any equipment before service or repair. Notify other operators of any unit malfunction and that you intend to repair it. Follow established safety procedures before and during the work.
- Safety precautions should be taken whenever plant operations personnel are working around the and RAS/WAS pump station. All equipment is capable of remote control operation and may start at any time. Prior to servicing or inspection, all equipment controls should be stopped and locked out locally.
- Adequate hearing protection should be worn in noisy environments such as blower and pump rooms.

2.7.4 MAINTENANCE

The facility should update any current maintenance procedures with the appropriate detailed information from the manufacturer's O&M manuals. The procedures and maintenance schedules recommended by the manufacturer's publications must be followed to maintain complete warranty coverage of the facility equipment and ancillary equipment. After the warranty period, revisions to the maintenance schedules should be made based on the operation and maintenance experience and approved by a designated manager. The revisions should address the frequency of mechanical inspection based on the amount of wear observed during the warranty period.

2.8 – Plant Utility Systems

2.8.0 GENERAL PROCESS DESCRIPTION

The California Department of Corrections and Rehabilitation's (CDCR) California Men's Colony (CMC) Wastewater Treatment Facility (WWTF) has utility systems to assist in the daily operation and maintenance of the facilities. A number of these utilities are required for the operation of the facility. A utility is generally considered to be a stand-alone system, where if the process is shutdown dependent equipment at the facility will also shutdown. The utility systems described in this chapter are the Plant Water System and Electrical Supply. Figures 10.1 and 10.2 show the Plant Water Pump Stations and Reclaimed Water on the chlorine contact basins and electric supply utility schematic.

2.8.1 Startup/Shutdown Procedures

The following is a brief description of the plant utility system startup and shutdown procedures. Refer to the equipment O&M manuals for specific information regarding lubrication and specific equipment checks.

Startup

Potable Water System

1. Check for piping leaks and tighten flanges as required.
2. Crack open a hose bib or spray water valves to allow air to vent. Do not open the valves all the way, as the transition from venting air to venting water could cause a water hammer that would break pipes.
3. When the water distribution piping approaches operating pressure put all of the systems that use potable water back into automatic control.
4. If required, close valves that were opened for draining the system prior to repair or venting air during the startup.

Plant Water System

5. After the electrical connections are completed, bump the pump to verify proper rotation.
6. Remove "Do Not Operate" lockout/tagout tags. Manually start the pump.
7. Check for piping leaks and tighten flanges as required.
8. Crack open a hose bib or spray water valve to allow air to vent. Do not open the valves all the way, as the transition from venting air to venting water could cause a water hammer that would break pipes. After venting air, return the system to normal operation.
9. Close valves that were opened for draining the system prior to repair or venting air during the startup.
10. It is a good idea to check the current draw of a newly installed pump.

Electrical Supply

Startup of major electrical systems should only be conducted by qualified electricians. Prior to closing an electrical circuit, all of the equipment powered by that circuit should be shutdown. After power has been restored, most equipment will restart automatically.

Shutdown of major electrical systems should only be conducted by qualified electricians. Prior to opening an electrical circuit all of the equipment powered by

that circuit should be shutdown.

Shutdown

Potable Water System

11. Close the backflow preventer isolation valves.
12. If required, drain the system by opening a hose bib. Drain the water to a plant drain and not the storm drain.
13. Complete the repair or connection to the system.

Plant Water System

14. Switch the pumps off. Hang "Do Not Operate" lockout/tagout tags at the LCP.
15. If required, drain the system by opening a hose bib.
16. Complete the repair or connection to the system.

Electrical Supply

Shutdown of major electrical systems should only be conducted by qualified electricians. Prior to opening an electrical circuit, all of the equipment powered by that circuit should be shutdown.

2.8.2 ALARM CONDITIONS

This section describes alarm conditions that can occur during operation of the utility systems. The alarms provide for operational surveillance of the equipment, alerting operators to abnormal conditions. Alarm conditions are annunciated either at the OIS, located in the control room, and/or at the LCPs.

Operations Strategy

When an alarm occurs, the Operator acknowledges the alarm at the LCP, or OIS examines the process condition on the OIS, LCP, and takes corrective action, if possible. Then operator proceeds to the equipment or area originating the alarm (assuming that it is a safe location). At the equipment, the operator assesses the problem and determines the corrective actions required. Observe the established safety procedures during all operations, including operation under emergency conditions.

The following lists descriptions of each alarm, its indication, possible causes, and suggested response actions.

Plant Water System Low Water Pressure

Indication: Low Water Pressure Alarm indicated at the OIS.

Action:
1. Acknowledge the alarm at the OIS.
2. Look for a broken water line.
3. Check for the operation of the pumps.

Plant Water System High Water Pressure

Indication: High Water Pressure Alarm indicated at the OIS.

Action:
1. Acknowledge the alarm at the OIS.
2. Look for a blockage in the water line or duplex filter.
3. Check for the operation of the pumps.

Pump Motor Stator High Temperature (One per pump)

Indication: Overheating of pump motor indicated at the OIS.

Action:
1. Remove pump from service.
2. Insert standby pump into sequence.
3. Remove pump from service to determine if impeller is clogged.

VFD Fail

Indication: VFD failed to start or failed to operate indicated at the OIS.

Action:
1. Remove VFD from service.
2. Check owner's manual for troubleshooting procedures.

Specific Emergency Generator Alarms

Indication: Each alarm is displayed at the OIS.

Action:
1. Acknowledge the alarm at the OIS.
2. Check for proper operation of the generator.
3. Each specific alarm, low oil pressure, high coolant temperature, overspeed, overcrank, low fuel tank, or battery charger, provide information on the emergency at the LCP. Investigate the source of each alarm.

Emergency Generator Fail Alarm

Indication: Emergency Generator Fail alarm indicated at the OIS and at the LCP.

Action:
1. Acknowledge the alarm at the OIS.
2. Check for remote control of the equipment.
3. Check the generator for excessive temperature, low oil pressure, coolant, and fuel. Add fluids as required.
4. Attempt to start the generator in local control. Inspect the equipment for proper operation and determine the cause of failure.

2.8.3 SAFETY

These safety instructions are provided as general guidelines only for operation of the utility systems. They are not intended to replace existing plant safety instructions and procedures.

- Always lockout any equipment before service or repair. Notify other operators of any unit malfunction and that you intend to repair it. Follow established safety procedures before and during the work.
- Safety precautions should be taken whenever plant operations personnel are working around the utility water or reuse pumps, as well as the emergency generator. All equipment is capable of remote control operation and may start at any time. Prior to servicing or inspection, all equipment controls should be stopped and locked out locally.
- Adequate hearing protection should be worn in noisy environments such as blower and pump rooms.

2.8.4 MAINTENANCE

The facility should update any current maintenance procedures with the appropriate detailed information from the manufacturer's O&M manuals. The procedures and maintenance schedules recommended by the manufacturer's publications must be followed to maintain complete warranty coverage of the facility equipment and ancillary equipment. After the warranty period, revisions to the maintenance schedules should be made based on the operation and maintenance experience and approved by a designated manager. The revisions should address the frequency of mechanical inspection based on the amount of wear observed during the warranty period.

2.9 – Biosolids Dewatering, Storage, And Disposal

2.9.0 GENERAL PROCESS DESCRIPTION

The purpose of the Biosolids Dewatering Facility is to process the waste activated sludge (WAS) into a drier, more manageable form by removing a large percentage of the water. Dewatering also reduces the volume of material to be disposed. Once dewatered, the solids may be disposed of at a licensed offsite landfill facility biosolids processing facility.

Biosolids dewatering is accomplished at the CMC WWTF by the use of centrifuges. The Centrifuges dewater the waste activated sludge (WAS) through high-speed rotation, concentrating the solids and separating the liquid. The mechanically dewatered solids are referred to as "cake" and the separated liquid is referred to as "Centrate." The cake should have approximately an18 percent total solids content. The centrifuge utilizes polymer to flocculate solids prior to dewatering which allows approximately 95 percent of the centrifuge feed solids to be concentrated in cake form. The Biosolids Dewatering Building contains the centrifuges, polymer system, conveyors and truck loading station.

Anaerobic digester "A" is now the WAS Holding Tank. This storage volume allows the WAS to be dewatered on a single shift schedule, if desired. Digester "A" uses the existing recirculation system, which maintains a consistent solids concentration throughout the tank. The two progressive cavity sludge feed pumps are located next to Digester "A", which is now called the Sludge Holding Tank. Digester "B" is abandoned in place.

2.9.1 Startup/Shutdown Procedures

The following is a brief description of the disinfection facilities startup and shutdown procedures. Refer to the equipment O&M manuals for specific information regarding lubrication and specific equipment checks.

Startup

Pre-Startup and Safety Checks

1. Verify equipment OFF and LOCKED OUT locally
   a. Centrifuge
   b. Knife Gates
   c. Centrifuge Feed Pumps
   d. Sludge Grinder
   e. Polymer Recirculation Pumps
   f. Polymer Blenders
   g. Screw Conveyors
2. Verify all equipment guards, shields, etc. are properly installed.
3. Lubricate equipment as necessary.
   a. Centrifuge
   b. Knife Gates
   c. Centrifuge Feed Pumps
   d. Sludge Grinder
   e. Polymer Recirculation Pumps
   f. Polymer Blenders

g. Screw Conveyors

4. Check centrifuge oil lubrication system.
   a. Verify adequate hydraulic oil supply in reservoir.
5. Check Centrifuge Building and centrifuge feed pump area.
6. Check alarm systems.
7. Check Sludge Holding Tank (formerly Digester "A") level.
8. Check valve lineup for all utility and polymer piping
9. Verify polymer tank recirculation pumps are operational and polymer storage tanks are sufficiently mixed.
10. Verify that desired polymer dose is set for speed sand stroke controllers at metering pump on duty polymer blender.
11. Communications check.

Startup - Manual Operation

1. Verify all pre-startup and safety checks have been completed.
2. Supply power to equipment.
3. Set grinder in "Auto" at local control panel.
4. Set Polymer Blender desired for service in "Auto" at local control panel
5. Set Screw Conveyors in "Remote" mode at MCC-B.
6. Set Centrifuge Feed Pump desired for service in "Auto" mode at MCC-SH.
7. Set 11-LCP-001 or 11-LCP-002 in "Manual"
8. Open lube oil cooling water valve at LCP-CCP-1.
9. Start centrifuge at 11-LCP-001 or 11-LCP-002.
10. Start polymer blender at 11-LCP-003, 11-LCP-004, or11-LCP-005.
11. Start centrifuge feed pump at VFD at starting speed.
12. Once seal is reached in Centrifuge, start screw conveyors at 11-LCP-006 and adjust feed rate to desired setting.
13. Select automatic torque code, if desired. Otherwise, verify that unit is in automatic differential speed setpoint control.
14. Optimize settings.

Start - Automatic Operation

1. Follow Steps 1-6 above for Manual Operation.
2. Set 11-LCP-001 or 11-LCP-002 in "Auto" Mode
3. Press "Auto Start" button.
4. Follow steps 13 and 14 above for Manual Operation.

Shutdown

1. Communications check.
2. Press "Auto Stop" button on 11-LCP-001 or 11-LCP-002.
3. Press "CIP Start" button on LCP-CCP-a, if desired.

2.9.2 ALARM CONDITIONS

This section describes the alarm conditions that can occur during operation of the solids dewatering process. The alarms provide for operational surveillance of the system, alerting operators to alarm conditions in progress and alarm conditions that have been reset. Alarm conditions are annunciated either through the SCADA system (OIS), MCC and/or at the Local Control Panels (LCPs).

Operations Strategy

When an alarm occurs, the operator who acknowledges the alarm at the LCP or OIS examines the process condition on the OIS, LCP or MCC and takes corrective action, if possible. The operator then proceeds to the equipment or area originating the alarm (assuming that it is a safe location). At the equipment that originated the alarm, the operator assesses the problem and determines the corrective actions required. The established safety procedures are to be observed during all operations, including operation under emergency conditions.

The following sections contain descriptions of each alarm, its indication, possible causes, and suggested response actions. The alarms listed here do not include any of the "intuitive" alarms created within the PLC. "Intuitive" alarms include those that signal the failure of a PLC resident command. This section details actual process and instrumentation condition alarms incorporated in the design of the facility. Any subsequent modifications should be noted and addresses in this section of the O&M manual.

WAS Holding Tank

Indication: Sludge Feed Valve Failure
Action:
1. Acknowledge alarm at OIS.
2. Check for obstruction of the valve. Flush line if necessary.
3. Operate valve in manual to verify proper operation.
4. Reset operation of equipment.

Indication: Recirculation Valve Failure
Action:
1. Acknowledge alarm at OIS.
2. Check for obstruction of the valve. Flush line if necessary.
3. Operate valve in manual to verify proper operation.
4. Reset operation of equipment.

Indication: Recirculation Pump Failure
Action:
1. Acknowledge the alarm at the LCP.
2. Check MCC for trip condition.
3. Reset and restart motor once.
4. If motor starts, reset alarm.
5. If motor will not run, remove from service. Investigate cause of pump failure.

Indication: WAS Holding Tank High Level Alarm
Action:
1. Acknowledge the alarm at the LCP.
2. Verify the tank high sludge level.
3. If centrifuge dewatering is planned, start centrifuge and begin removing sludge from holding tank.
4. If centrifuge dewatering is not planned, place the alternate holding tank in service.

Indication: WAS Holding Tank Low Level Alarm
Action:
1. Acknowledge the alarm at the LCP.
2. Verify the tank low sludge level.

3. Low level alarm is interlocked with centrifuge feed pumps. Begin shutdown of dewatering process.
4. Resume centrifuge dewatering only after sufficient sludge level is attained in holding tank.

Sludge Feed Pumps

Indication: Centrifuge Feed Pump Failure

Action:
1. Acknowledge the alarm at the LCP.
2. Stop and lockout collector mechanisms.
3. Reset and restart motor once.
4. If motor starts, reset alarm.
5. If unit will not run, remove from service. Switch standby pump to duty status.

Indication: Centrifuge Feed Pump Failure / Discharge Pressure High

Action:
1. Acknowledge the alarm at the LCP.
2. Check MCC for trip condition.
3. Check for proper valve alignment.
4. Reset and Restart motor once.
5. If motor starts, reset alarm.
6. If unit will not run, remove from service. Switch standby pump to duty status.
7. Investigate discharge piping for blockages.

Sludge Grinder

Indication: Sludge Grinder Failure

Action:
1. Acknowledge the alarm at the LCP.
2. Check MCC for trip condition.
3. Reset and restart motor once.
4. If motor starts, reset alarm.
5. If unit will not run, remove from service. Place alternate centrifuge in service, bypass grinder, or suspend centrifuge dewatering until problem is resolved.

Centrifuge

Indication: Centrifuge Failure

Action:
1. Acknowledge the alarm at the LCP.
2. Check MCC for trip condition.
3. Reset and restart motor once.
4. If motor starts, reset alarm.
5. If unit will not run, remove from service. Place alternate centrifuge in service or suspend centrifuge dewatering until problem is resolved.

Indication: Centrifuge Failure / Vibration High

Action:
1. Acknowledge the alarm at the LCP.
2. Check MCC for trip condition.
3. Reset and restart motor once.
4. If motor starts, reset alarm.
5. If vibration switch trips again, suspend centrifuge dewatering until problem is resolved.

Screw Conveyors

Indication: Screw Conveyor Failure

Action:
1. Acknowledge the alarm at the LCP.
2. Check MCC for trip condition.
3. Check emergency pull cords for trip condition.
4. Verify zero speed sensors are not tripping out.
5. Reset and restart motor once.
6. If motor starts, reset alarm.
7. If unit will not run, remove from service. Suspend centrifuge dewatering until problem is resolved.

Polymer System

Indication: Polymer Blending Unit Failure

Action:
1. Acknowledge the alarm at the LCP.
2. Check lighting panel for trip condition.
3. Reset and restart polymer blending unit once.
4. If unit starts, reset alarm.
5. If unit will not run, remove from service. Switch standby unit to duty status.

Indication: Polymer Tank Recirculation Pump

Action:
1. Acknowledge the alarm at the LCP.
2. Check lighting panel for trip condition.
3. Reset and restart polymer recirculation pump once.
4. If unit starts, reset alarm.
5. If unit will not run, remove from service. Switch standby unit to duty status.

Indication: Polymer Blending Unit Failure / Nonpotable Water Flow Loss

Action:
1. Acknowledge the alarm at the LCP.
2. Verify water flow to polymer blender.
3. Verify valves are correctly aligned.
4. Reset and restart polymer blending unit once.
5. If unit will not run, remove from service. Switch standby unit to duty status. Inspect flow switch for proper operation.

Indication: Plant Water System Low Flow or Low Pressure Alarm

Action:
1. Acknowledge the alarm at the LCP.
2. Check the flow meter and pressure gauges to determine if sensors are falsely indicating alarm condition.
3. Terminate centrifuge dewatering.
4. Resolve PW issues prior to resuming centrifuge dewatering.

Truck Loading

Indication: Sludge Loading

Action:
1. Unload & return truck / move empty truck under chute.
2. Dispense cake into empty truck.

2.9.3 SAFETY

These safety instructions are provided as general guidelines only, for operation of the facilities. They are not intended to supercede or supplant existing plant safety instructions and procedures.

- Always lockout any equipment before service or repair. Notify other operators of any unit malfunction and that you intend to repair it. Follow established safety procedures before and during the work.
- The centrifuge feed lines, polymer feed lines, and nonpotable water lines are under pressure. Precautions should be taken to ensure that the equipment is isolated and the pressure is released carefully before working on equipment or piping.
- All structures and appurtenances should be kept in good repair and maintained in an orderly condition. The centrifuge feed and dewatered cake will contain polymer that can make walking surfaces extremely slippery. Firm footing and handholds should be maintained at all times.
- Some liquid polymers may irritate the skin. Avoid contact with polymers. Flush the skin or eyes with water should accidental contact occur. Refer to manufacturer's warning labels and MSDS sheets for specific instructions.
- Spilled polymer is hazardous because it is extremely slippery on any walking surfaces. The polymer feed areas have been designed to contain spilled polymer. However, do not walk on any wet surface in the polymer feed areas since there is always the possibility that polymer will be present. Clean up spills immediately and post the area until the floor is dry. Polymer can be cleaned up with dirt, salt, sodium hypochlorite or polymer solvent. Water and soap do not work well for cleaning spilled polymer.

2.9.4 MAINTENANCE

The centrifuge and associated equipment are designed to give a long service life. However, no piece of equipment can live up to performance expectations without an adequate preventative maintenance program.

The service life and efficiency of mechanical and hydraulic components are greatly affected by the oxidation and / or contamination of their lubricants. For this reason, lubrication schedules provided by the manufacturer should be adhered to. When adding lubricants, always use clean, uncontaminated stocks from properly stored, closed containers of the type prescribed in the manufacturer's lubricant schedule.

The manufacturer's O&M manuals for the centrifuge and the appurtenant equipment present the information required to implement a successful preventative maintenance program. The procedures and maintenance schedules recommended by the manufacturer's publications must be followed to maintain complete warranty coverage of the centrifuge and ancillary equipment.
Plant staff has a preventative maintenance program in place. This program should be updated with appropriate detailed information from the manufacturer's O&M manuals. Further revisions to the maintenance programs should be made based on Plant staff operation and maintenance experience.

Section 3.0 Electrical Startup

Prior to starting the motor, the electrical contractor will have finished the installation and will state in writing that the electrical system from the bucket to the motor is ready for inspection and motor bump. The State's representative will then, at a minimum, review the system for the following:

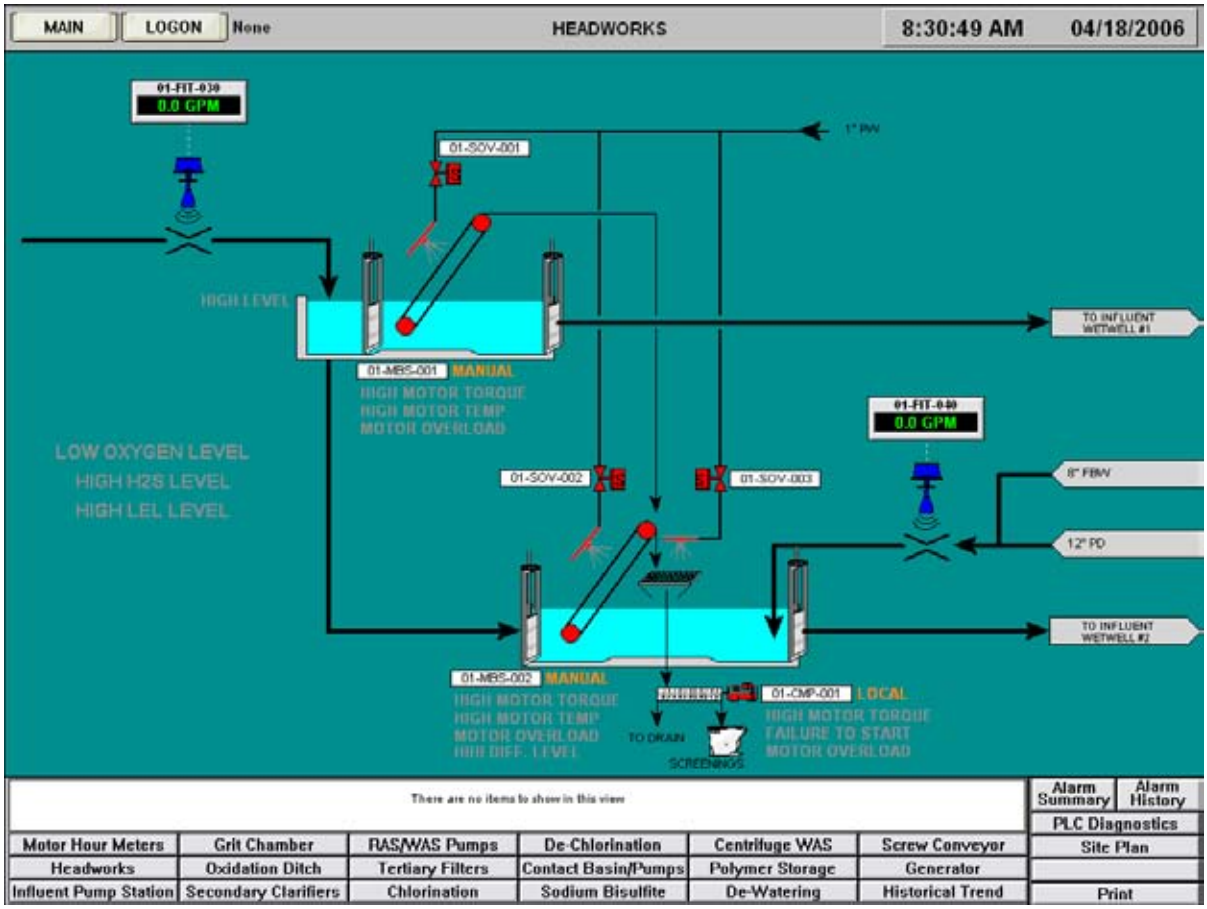
- Proper tag on the Motor Control Center bucket.
- Starter size and model.
- Primary voltage lines terminated.
- Primary voltage fuses in place.
- Motor starter lines terminated.
- Motor starter fuses in place.
- Current settings on projective devices are proper and documented.
- Inputs from control system are landed on starter.
- Outputs to control system are landed on HOA switch and motor starter.
- Local disconnect switch is off and lines are terminated.
- HOA switch is in the off position.
- Confirmation by the electrical foreman that the motor is ready to start.
- Close local disconnect and MCC bucket.
- Bump the motor by moving the HOA switch to H for a moment.
- Confirm proper rotation in the field.
- Amp draw under no load has been checked and documented.
- Start the motor and observe the motor and mechanical system.
- Instruments have been configured, calibrated and the appropriate documentation has been submitted.

Section 4.0 Instrumentation Startup

4.0 SYSTEM DESCRIPTION

The CMC Waste Water Treatment Facility is controlled through the use of the Programmable Logic Controller (PLC) and Human Machine Interface (HMI) software. These two systems control and monitor each section of the facility. It is crucial that each step of the startup procedure be followed correctly and in order to ensure the proper and safe functioning of the Facility.

4.1 HEADWORKS



Headworks – Combustible Gas Monitoring

EQUIPMENT NO.: 01-LCP-001, 01-AIT-31 (O2), 01-AIT-32 (H2S), 01-AIT-33 (LEL)

DRAWING NO.: N05

PROCESS DESCRIPTION: To alarm the high level for hydrogen sulfide (H2S) and methane LEL and the low level at oxygen (O2) in the headworks area.

LOCAL CONTROL: As shown on Drawing N05. Provide local control panel, alarm horn and beacon.

MCC FUNCTIONS: None.

PLC FUNCTIONS: Monitoring of oxygen, hydrogen sulfide, and combustible level at the headwork area. Annunciate gas monitor system fault.

FUNCTIONS TO BE TESTED: All functions of **01-LCP-001** as shown on **P&ID N05** and listed in part **3.01** of the Process Control Description.

TESTING PROCEDURE: Introduce known concentrations of testing gas to each instrument listed above. Verify readings of each instrument on local control panel 01-LCP-001. Verify alarms for high/low levels of detected gasses are transmitted to PLC-1 and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- O2 Value ☐ Checked if approved
- H2S Value ☐ Checked if approved
- LEL Value ☐ Checked if approved
- 01-AAL-031 (O2) — Gas detection low oxygen level ☐ Checked if approved
- 01-AAH-032 (H2S) — Gas detection H2S high level ☐ Checked if approved
- 01-YA-031 (System Fault) Gas detection fault monitor ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

_____

_____

HEADWORKS – MECHANICAL BARSCREENS

EQUIPMENT NO.: 01-LCP-002, 01-MBS-001, 01-LCP-003, 01-MBS-002, 01-LSHH-034

DRAWING NO.: N05

PROCESS DESCRIPTION: The two screening channels are provided with two mechanically

operated bar screens. The purpose of the screens is to remove trash and large particulate matter that might clog or damage downstream equipment. Screenings are discharged to a screenings compactor.

LOCAL CONTROL: Mechanical bar screens are controlled at the local control panels, 01-LCP-002 and 01-LCP-003. These LCP's shall perform the cycle control and cleaning of the screens as well as command and monitoring. Automatic screen operation shell be controlled by "differential levels" as shown.

Provide HAND/OFF/AUTO selection. Manual operation shell include "forward," "off and reverse."

Activate utility water sprays (solenoids) during cleaning cycle.

Monitor bar screen mechanism torque. Upon 100 percent of rated torque, shutdown, and lockout and bar screen mechanism, annunciate on LCP, and send HIGH TORQUE signal to the PLC. The bar screen mechanism lockout shall be maintained until the RESET pushbutton on the LCP is depressed.

Upon HIGH MOTOR TEMPERATURE, shutdown and lockout the bar screen mechanism, annunciate on LCP, and send HIGH TEMPERATURE signal to PLC.

Indicate "Running" condition for the two mechanical operated bar screens and provide this signal to the PLC.

Upon reaching high-high level LLSH-34 as detected by the float switch, the screens shall be shut down and condition alarmed at both LCP's.

MCC FUNCTIONS: None.

PLC FUNCTIONS: Monitoring, alarming, and load-shed functioning as depicted on drawing N05.

INTERLOCKS: Provide "running" relay contact at each bar screen LCP for starting the downstream compactor01-CMP-001.

FUNCTIONS TO BE TESTED: All functions of **01-LCP-002** and **01-LCP-003** as shown on **P&ID N05** and listed in part **3.02** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local control panels. Ultrasonic level transmitters may be tested using an acoustically reflective piece of material (stiff cardboard, plywood, sheet metal, etc.) held at various distances from transmitters to simulate different liquid levels. Float-type level switches can be verified by rotating the switch to the floating position. Unplugging the load shed dry contact relay OR forcing the relay OFF in the PLC may test load-shedding functions. Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 01-LAHH-034 - Mechanical bar screen #1 HIHI level ☐ Checked if approved

- 01-LDAHH-35, 01-LDAHH-037 bar screen #1, #2 diff. HIHI level ☐ Checked if approved
- 01-YA-036, 01-YA-038 - bar screen #1, #2 overload ☐ Checked if approved
- 01-TAH-036, 01-TAH-038 bar screen #1, #2 high motor temp. ☐ Checked if approved
- 01-WAH-036, 01-WAH-038 bar screen #1, #2 high motor torque ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS TO BE VERIFIED:

- 01-YL-036A, 01-YL-038A - bar screen #1, #2 motor run ☐ Checked if approved
- 01-YL-036B, 01-YL-038B - bar screen #1, #2 motor auto ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

_____

_____

HEADWORK'S – Screenings Washer/Compactor

EQUIPMENT NO.: 01-LCP-004, 01-CMP-001

DRAWING NO.: N05

PROCESS DESCRIPTION: Screenings are removed from the plant influent and placed on a conveyor to the screenings compactor. Screenings are compacted and discharged to bin.

LOCAL CONTROL: Provide local control panel with alarms, reset and indication as shown on drawing N05.

When any bar screen mechanism cleaning cycle is activated or the bar screen is running, run compactor. Continue running compactor for an adjustable period (0-600 seconds, initially set to 60 seconds) after the bar screen cleaning cycle has STOPPED.

Open spray header solenoid valves (01-SOV-003) when compactor is running.

Monitor compactor torque. Upon motor failure where the motor exceeds the rated torque annunciate OVERLOAD on LCP, send HIGH TORQUE OVERLOAD signal to PLC, and shutdown compactor and lockout compactor.

Provide an EMERGENCYSTOP pull wire. Shutdown compactor and lockout compactor when activated.

Upon receiving a "START" command and the compactor does not start after a set time delay, a "FAIL TO START" alarm shall be initiated and indicated at the local control panel and t the OIS.

MCC FUNCTIONS: None.

PLC FUNCTIONS: Provide alarms, indications and "load shed" command as shown on drawing N05

FUNCTIONS TO BE TESTED: All functions of **01-LCP-004** as shown on **P&ID N05** and listed in part **3.03** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local control panel. Unplugging the load shed dry contact relay OR forcing the relay OFF in the PLC may test load-shedding functions. Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 01-WAH-039 - Screenings washer/comp. high motor torque ☐ Checked if approved
- 01-YA-039A - Screenings washer/compactor overload ☐ Checked if approved
- 01-YA-039B - Screenings washer/compactor fail to start ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS TO BE VERIFIED:

- 01-YL-039A - Screenings washer/compactor remote ☐ Checked if approved
- 01-YL-039B - Screenings washer/compactor run reverse ☐ Checked if approved
- 01-YL-039C - Screenings washer/compactor run forward ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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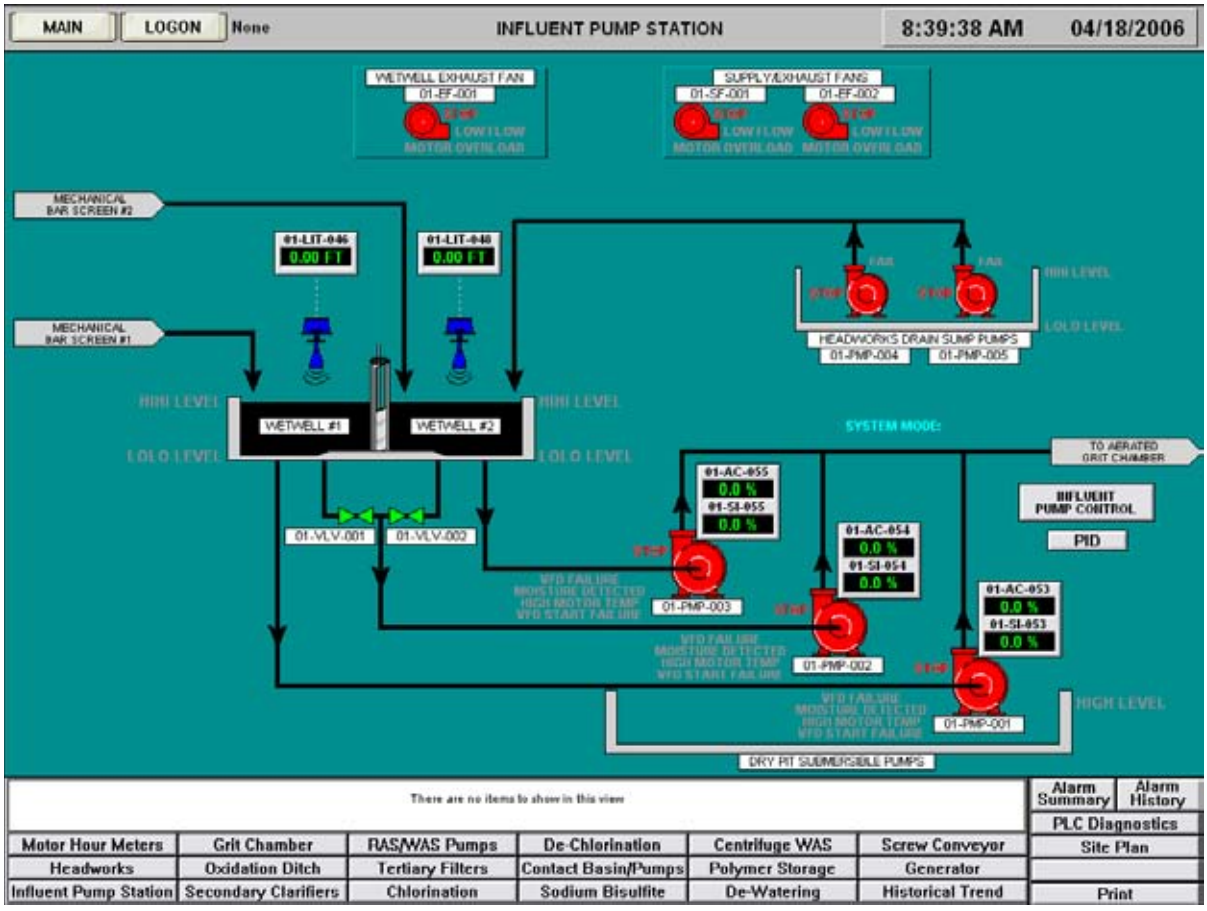
4.2 INFLUENT PUMP STATION



HEADWORKS – INFLUENT PUMP STATION

EQUIPMENT NO.: 01-PMP-001, 01-PMP-002, 01-PMP-003, 01-FIT-030, 01-LIT-046, 01-LIT-048, 01-VLV-001, 01-VLV-002

DRAWING NO: N05 and N06

PROCESS DESCRIPTION: The Influent Pumps pump influent from the headwork's wet well to the Aerated Grit Chamber.

When the influent flow, Tag No.01-FI-30, is above 0.80 mgd (1.23 cfs), the influent pumps shall operate in a lead-lag-standby fashion to maintain a level set point in the headwork's wet well.
When the influent flow, Tag No. 01-FI-30, is below 0.80 mgd (1.23 cfs), the lead influent pump shall operate based on start and stop level. The second and third influent pump will be designated as the standby pump. The start level shall be the set point plus 2 feet, which is equivalent to 9 feet above the floor of the wet well. The stop level shall be set point minus 3 feet, which is equivalent to 4 feet above the floor of the wet well.

LOCAL CONTROL: Instrumentation and Protection Devices for the influent pumps:

Temperature elements for pump motor. Moisture elements for pump motor. LOCKOUT STOP Pushbuttons.

Interlocks:

Monitor motor winding temperature, and shut down and lock out the pump in the event of high temperature and transmit PUMP HIGH TEMPERATURE alarm to the MCC and PUMP FAIL Alarm to the PLC.

Monitor motor windings for moisture and shut down and lock out the pump in the event of moisture and transmit to PUMP MOISTURE alarm to the MCC and PUMP FAIL to the PLC.

When a pump is locked out, it shall remain locked out until the RESET pushbutton is depressed.

LOW WET WELL LEVEL ALARMS from both wet wells is transmitted to the PLC when Low Level s detected.

HIGH WET WELL LEVEL ALARMS from both wet wells is transmitted to the PLC when High Level is detected.

- Well No. 1 level switch 01-LSHH-047 activated, START Pump No.1 and No. 2.
- Well No. 1 level switch 01-LSLL-047 activated, STOP Pump No. 1 and No. 2.
- Well No. 2 level switch 01-LSHH-049 activated START Pumps No. 2 and No. 3.
- Well No. 2 level switch 01-LSLL-049 activated STOP Pumps No. 2 and No. 3

Influent Pump No. 2, 01-PMP-002 shall not be activated if valves, 01-VLV-001 and 01-VLV-002 are both closed.

Local Instrumentation

- Level Indicating Sensor Transmitter, one in each wet well.
- High Level Alarm floats in each wet well.
- Low Level Alarm float in each wet well.

MCC FUNCTIONS: VFD Controls (Each Pump):

LOCAL/OFF/REMOTE Selector switch.

START/STOP Pushbutton.

Manual Speed Command Controller.

RESET Pushbutton.

VFD Indicators and Alarms (Each Pump):

RUN indicating Light.

VFD FAIL Alarm Light.

PUMP OVERLOAD Alarm.

MOISTURE FAIL Alarm.

PLC FUNCTIONS: Controls:

Manual Mode: START/STOP and manual speed setpoint from OIS

Automatic Mode with influent flow (01-FIT-03) greater than 0.08 mgd (1.23 cft):

Operator selects LEAD/LAG/STANDBY sequence (1-2-3,1-3-2, 2-3-1,2-1-3,3-2-1,3-1-2).

PLC receives wet well signal from level indicating transmitter and utilizes a proportional plus integral plus derivative (PID) algorithm to maintain an adjustable level setpoint (initially set at 7 feet from the bottom of wet well) by controlling the lead and lag pumps (on-off and speed control). Each VFD shall transmit a 4-20 milliampere signal, which is proportional to pump speed. The PLC shall utilize the speed signal to determine when pump is at low speed (initially set at 555 RPM) or high speed (initially set at 1,170 RPM).

The "wet well level" used for controlling the pumps operation shall be selectable from 01-LIT-46 and 01-LIT-48 level transmitters. Operator shall determine and select the wet well level either from Wet Well No.1 or Wet Well No. 2 for control of the pumps

When the Influent Pump Station wet well level increases above the wet well level setpoint (LSP) for more than an adjustable time delay (initially set at 20 seconds), the lead pump shall start and modulate based upon the PID control signal to maintain the LSP. If the level increases and remains above the LSP continuously for more than an adjustable time delay

with the lead pump running at maximum speed, the lead pump shall ramp down to 830 rpm and a second (LAG) pump shall simultaneously start at the same speed. Both pumps shall modulate together based upon the PID control signal from the PLC to maintain the LSP.

With two pumps running, if the level decreases and remains below the LSP continuously for more than the adjustable time delay with the pumps running under 830 RPM, the LAG pump shall stop, and the lead pump shall ramp up to 95 percent of maximum speed and modulate based upon the PID control signal.

If the PLC attempts to run a pump and does not receive a PUMP ON signal within an adjustable time initially set to 10 seconds, the PLC shall lock out the pump and initiate a FAIL TO START alarm. The pump shall remain locked out until RESET selection has been made. The start AUTOMATIC sequence will then be shifted to the next available pump (I.e., from LEAD to LAG or LAG to STANDBY).

Monitor wet well level and annunciates HIGH HIGH WATER LEVEL Alarm or LOW LOW WATER LEVEL Alarm if the water level in the wet well rises above 10 feet or drops below 3.5 feet. Bypass LOW LOW LEVEL Alarm if wet well are out of service.

Automatic Mode with Influent Parshall flume flow (01-FIT-30) less than 0.80 mgd (1.23 cfs)

The pump will start and stop based on a wet well level range (from 01-LIT-46 or 01-LIT-48) and its setpoint. The lead pump will run at set low speed of 555 rpm (42Hz). The pump will start when the level reaches the setpoint plus 2 feet (9 feet above the wet well floor). The pump will stop when the level reaches the setpoint minus 3 feet (4 feet above the wet well floor).

Under no circumstances will the pump run at a low speed less than 555 rpm (42Hz)

Interlock:

If either high high level float switch is activated, two pumps shall turn on and pump until the level reaches the setpoint.

If either low low level float switch is activated, two pumps shall turn on and pump until the level reaches the setpoint.

Screen Indicators and Alarms:

RUN indication (each pump).

MOTOR FAIL alarm (each pump)

LOCAL/REMOTE indication.

FAIL TO START alarms (each pump).

Run Time Meter (each pump).

Lead, lag, and standby pump selection.

VFD FAIL alarm (each pump)

Speed indication

HIGH WATER LEVEL Alarm

LOW WATER LEVEL Alarm

FUNCTIONS TO BE TESTED:

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local VFD control panels. Ultrasonic level transmitters may be tested using an acoustically reflective piece of material (stiff cardboard, plywood, sheet metal, etc.) held at various distances from transmitters to simulate different liquid levels. Float-type level switches can be verified by rotating the switch to the floating position. Unplugging the load shed dry contact relay OR forcing the relay OFF in the PLC may test load-shedding functions. Verify that required alarms and status indicators are transmitted to PLC-1 and are displayed on the OIS.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 01-LAL-046, 01-LAH-046 - Influent wet well #1 Hi & Lo level ☐ Checked if approved
- 01-LALL-047, 01-LAHH-047 - Influent wet well #1 HIHI & LOLO level ☐ Checked if approved
- 01-LAL-048, 01-LAH-048 - Influent wet well #2 Hi & Lo level ☐ Checked if approved
- 01-LALL-049, 01-LAHH-049 - Influent wet well #2 HIHI & LOLO level ☐ Checked if approved
- 01-YA-053 - Dry pit sub. Pump #1 VFD FAIL ☐ Checked if approved
- 01-XA-053 - Dry pit sub. Pump #1 moisture detected ☐ Checked if approved
- 01-TAH-053 - Dry pit sub. Pump #1 High motor temp ☐ Checked if approved
- 01-YA-054 - Dry pit sub. Pump #2 VFD FAIL ☐ Checked if approved
- 01-XA-054 - Dry pit sub. Pump #2 moisture detected ☐ Checked if approved
- 01-TAH-054 - Dry pit sub. Pump #2 High motor temp ☐ Checked if approved
- 01-YA-055 - Dry pit sub. Pump #3 VFD FAIL ☐ Checked if approved
- 01-XA-055 - Dry pit sub. Pump #3 moisture detected ☐ Checked if approved
- 01-TAH-055 - Dry pit sub. Pump #3 High motor temp. ☐ Checked if approved
- 01-LAH-056 - Dry pit High level ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 01-LI-046 - Influent wet well #1 level ☐ Checked if approved
- 01-LI-048 - Influent wet well #2 level ☐ Checked if approved
- 01-LIC-050 - Influent wet well level PID loop ☐ Checked if approved
- 01-ZLC-050 - Influent wet well #1 valve closed ☐ Checked if approved
- 01-ZLC-051 - Influent wet well #2 valve closed ☐ Checked if approved
- 01-CS-047 - OIS in/out of service switch ☐ Checked if approved
- 01-CS-049 - OIS in/out of service switch ☐ Checked if approved
- 01-CS-050A - OIS in/out of service switch ☐ Checked if approved
- 01-LS-050B - OIS PID auto/manual switch ☐ Checked if approved
- 01-CS-052 - OIS pump sequencer switch ☐ Checked if approved

- 01-AC-053 - Dry pit sub. Pump #1 speed reference ☐ Checked if approved
- 01-SI-053 - Dry pit sub. Pump #1 speed feedback ☐ Checked if approved
- 01-YL-053A - Dry pit sub. Pump #1 remote ☐ Checked if approved
- 01-YL-053B - Dry pit sub. Pump #1 run ☐ Checked if approved
- 01-AC-054 - Dry pit sub. Pump #2 speed reference ☐ Checked if approved
- 01-SI-054 - Dry pit sub. Pump #2 speed feedback ☐ Checked if approved
- 01-YL-054A - Dry pit sub. Pump #2 remote ☐ Checked if approved
- 01-YL-054B - Dry pit sub. Pump #2 run ☐ Checked if approved
- 01-AC-055 - Dry pit sub. Pump #3 speed reference ☐ Checked if approved
- 01-SI-055 - Dry pit sub. Pump #3 speed feedback ☐ Checked if approved
- 01-CS-053A - Pump #1 OIS man/auto switch ☐ Checked if approved
- 01-CS-053B - Pump #1 OIS start/stop switch ☐ Checked if approved
- 01-SIK-053 - Pump #1 OIS manual speed control ☐ Checked if approved
- 01-CS-054A - Pump #2 OIS man/auto switch ☐ Checked if approved
- 01-CS-054B - Pump #2 OIS start/stop switch ☐ Checked if approved
- 01-SIK-054 - Pump #2 OIS manual speed control ☐ Checked if approved
-
- 01-CS-055A - Pump #3 OIS man/auto switch ☐ Checked if approved
- 01-CS-055B - Pump #3 OIS start/stop switch ☐ Checked if approved
- 01-SIK-055 - Pump #3 OIS manual speed control ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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HEADWORKS – DRAIN SUBMERSIBLE PUMPS

EQUIPMENT NO.: 01-PMP-004, 01-PMP-005, 01-LSL-058, 01-LSH-058, 01-LSHH-058

DRAWING NO.: N07

PROCESS DESCRIPTION: Duplex submersible sump pumps specified in Section 11312J. Pumps will pump wash down and drain water from lower level of influent pump station into Wet Well No.2. Pumps operate on START/STOP mode based on level float switches.

Manufacture to provide local control panel. One pump shall operate at a time as duty pump. Second pump is a standby Alternate Duty Pump.

LOCAL CONTROL: Provide Local Control Panel from pump manufacturer as specified in Section 11312J.

MCC FUNCTIONS: None.

PLC FUNCTIONS: RUN indication (each pump), MOTOR fail alarm (each pump), RUN time meter (each pump), DUTY and standby pump selection, HIGH WATER LEVEL ALARM.

FUNCTIONS TO BE TESTED: All functions of **01-LCP-005** as shown on **P&ID N07** and listed in part **3.05** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local control panel. Float-type level switches can be verified by rotating the switch to the floating position. Unplugging the load shed dry contact relay OR forcing the relay OFF in the PLC may test load-shedding functions. Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 01-LALL-058, 01-LAHH-058 - Drain sump HIHI & LOLO level ☐ Checked if approved
- 01-YA-059 - Drain sump pump #1 overload ☐ Checked if approved
- 01-YA-060 - Drain sump pump #2 overload ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 01-YL-059A - Drain sump pump #1 auto ☐ Checked if approved
- 01-YL-059B - Drain sump pump #1 run ☐ Checked if approved
- 01-YL-060A - Drain sump pump #2 auto ☐ Checked if approved
- 01-YL-060B - Drain sump pump #2 run ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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HEADWORKS – SUPPLY AND EXHAUST FANS

EQUIPMENT NO.: 01-SF-001 01-EF-002, 01-EF-001, 01-FSL-062, 01-FSL-063, 01-FSL-065

DRAWING NO.: N07

PROCESS DESCRIPTION: Supply and exhaust air fans in the influent pump station and wet well exhaust fan to provide ventilation.

LOCAL CONTROL: Provide a START/LOCK-OUT STOP switch for fan motor operation. Provide RUN indication to the PLC. When switched to ON, run the fan motor. When switched to OFF, fan motor shall be off.

MCC FUNCTIONS: Provide RUN status. Provide thermal OVERLOAD status.

INTERLOCKS: Shut down the supply fans and exhaust fans in the influent pump station upon detection of smoke in the vents.

PLC FUNCTIONS: Display no airflow alarms, overloads and run status for fans.

Provide load-shed output interlock.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N07** and listed in part **3.06** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local MCC's. Unplugging the load shed dry contact relay OR forcing the relay OFF in the PLC may test load-shedding functions. Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 01-FAL-062 - Supply fan low flow ☐ Checked if approved
- 01-YA-062 - Supply fan overload ☐ Checked if approved
- 01-FAL-063 - Exhaust fan low flow ☐ Checked if approved
- 01-YA-063 - Exhaust fan overload ☐ Checked if approved
- 01-FAL-065 - Wet well exhaust fan low flow ☐ Checked if approved
- 01-YA-065 - Wet well exhaust fan overload ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 01-YL-062 - Supply fan RUN ☐ Checked if approved
- 01-YL-063 - Exhaust fan RUN ☐ Checked if approved
- 01-YL-065 - Wet well exhaust fan RUN ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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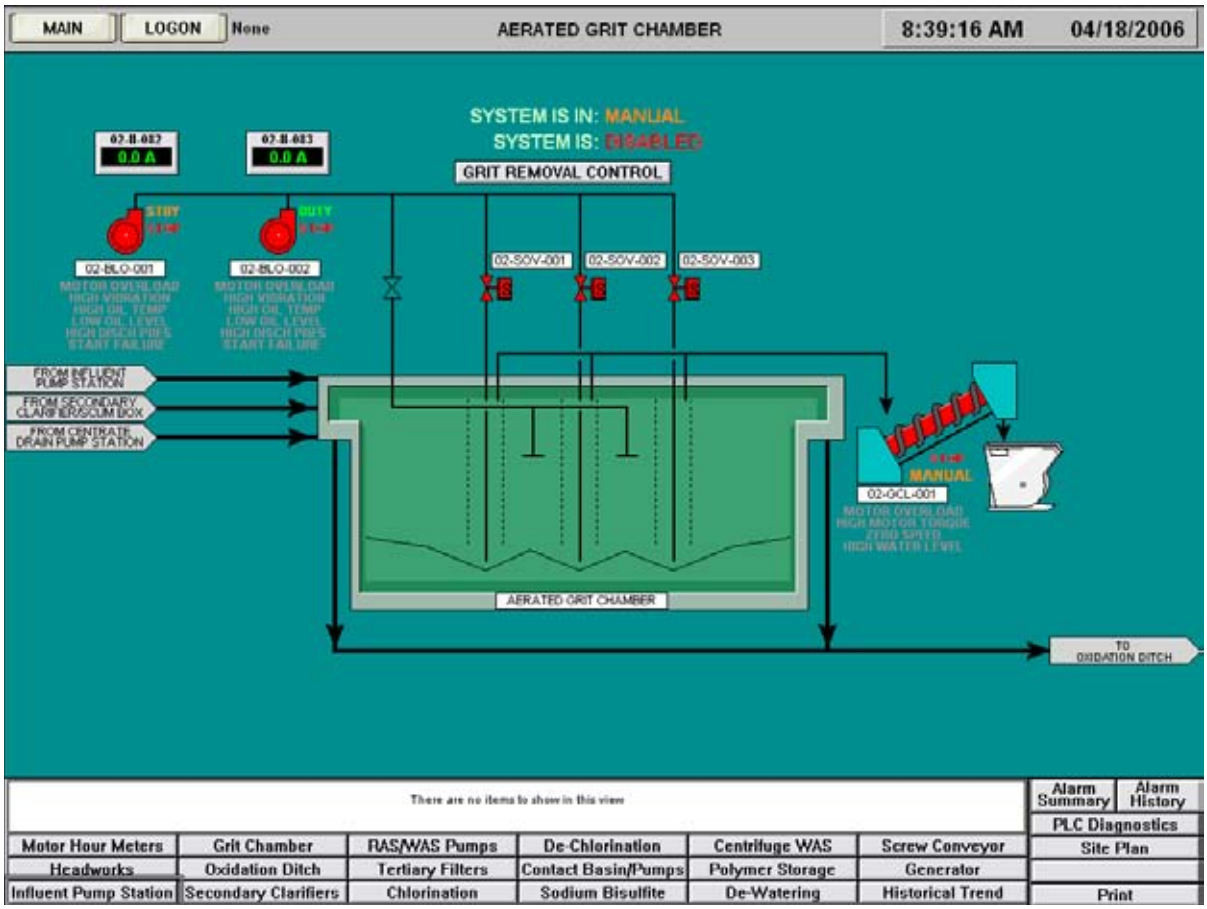
4.3 GRIT REMOVAL - BLOWERS



GRIT REMOVAL - BLOWERS

EQUIPMENT NO.: 02-LCP-006, 02-BLO-001, 02-LCP-007, 02-BLO-002, 02-PSH-062, 02-PSH-063

DRAWING NO.: N08

PROCESS DESCRIPTION: Screened influent wastewater is pumped to the aerated grit chamber. Air from the Grit Blower is applied to induce a roll in the chamber. Heavy particulates (grit) are removed from the liquid stream by setting to the bottom of the basin. Grit is removed by air pumps from the bottom of the basin and discharged to the grit classifier. There are two grit blowers. One will run and one will be a standby.

LOCAL CONTROL: Provide local control panels (LCP) as shown on Drawing N08.

Provide a LOCAL/OFF/REMOTE selector switch. When in the LOCAL position, a START/ LOCKOUT/STOP switch in the LCP will operate the blower.

Provide blower mechanism RUN indication.

Monitor grit blower high oil temperature, low oil level, and high vibration discharge pressure. Upon failure of grit blower due to high temperature, vibration, high discharge pressure, or low oil level alarm, shutdown grit blower and lockout the blower mechanism. Send high oil temperature, high vibration, high discharge pressure, low oil level signal, and grit blower FAIL alarms to the PLC. The grit blower mechanism lockout shall be maintained until the RESET pushbutton on the LCP is depressed.

Indicate blower current at LCP and send signal to PLC.

MCC FUNCTIONS: Indicate blower RUN

PLC FUNCTIONS: Provide remote "DUTY/STANDBY" operation of the blowers when the LOR selections at the LCP are at "remote."

Provide alarms and indication for the blowers as indicated on Drawing N08

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N0**8 and listed in part **3.07** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local control panels and MCC's. Pressure switches may be verified by closing all downstream discharge and vent valves to momentarily over-pressurize blower discharge lines. Unplugging the load shed dry contact relay OR forcing the relay OFF in the PLC may test load-shedding functions. Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 02-LAL-082 - Grit chamber blower #1 low oil level ☐ Checked if approved
- 02-PAH-082 - Grit chamber blower #1 disc. high pressure. ☐ Checked if approved
- 02-TAH-082 - Grit chamber blower #1 high oil temp ☐ Checked if approved
- 02-VAH-082 - Grit chamber blower #1 high vibration ☐ Checked if approved
- 02-YA-082 - Grit chamber blower #1 overload ☐ Checked if approved
- 02-LAL-083 - Grit chamber blower #2 low oil level ☐ Checked if approved
- 02-PAH-083 - Grit chamber blower #2 disc. high pressure ☐ Checked if approved
- 02-TAH-083 - Grit chamber blower #2 high oil temp ☐ Checked if approved
- 02-VAH-083 - Grit chamber blower #2 high vibration ☐ Checked if approved

- 02-YA-083 - Grit chamber blower #2 overload ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 02-CS-081A - OIS man/auto switch ☐ Checked if approved
- 02-CS-081B - OIS duty/standby switch ☐ Checked if approved
- 02-CS-082 - Blower #1 OIS start/stop switch ☐ Checked if approved
- 02-II-082 - Blower #1 surge current ☐ Checked if approved
- 02-YL-082A - Grit chamber blower #1 remote ☐ Checked if approved
- 02-YL-082B - Grit chamber blower #1 run ☐ Checked if approved
- 02-CS-083 - Blower #2 OIS start/stop switch ☐ Checked if approved
- 02-II-083 - Blower #2 surge current ☐ Checked if approved
- 02-YL-083A - Grit chamber blower #1 remote ☐ Checked if approved
- 02-YL-083B - Grit chamber blower #1 run ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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GRIT REMOVAL – AIR LIFT PUMPS

EQUIPMENT NO.: 02-SOV-001, 02-SOV-002, 02-SOV-003

DRAWING NO.: N08

PROCESS DESCRIPTION: Screened influent wastewater is introduced to the aerated grit chamber. Air is applied to induce a roll in the basins. Heavy particulates (grit) are removed from the liquid stream by settling to the bottom of the basin. Grit is removed by air lift pumps from the bottom of the basin. The air pumps do not have motors but are operated by air from the grit blower. Air to each basin is controlled by a solenoid valve set open or close based on a sequencer in the PLC.

There are 3 grit pumps in the chamber. Each grit pump is sequenced to run for a period of time (typically 60 minutes). The pumping sequence consists of:

1. OPEN air (energize solenoid valve) for 50 minutes (adjustable 0-60 minutes).

2. CLOSE air (de-energize solenoid valve) for 40 minutes adjustable 0-60 minutes).

LOCAL CONTROL: None

MCC FUNCTIONS: None

PLC FUNCTIONS: Master grit sequencer initiates each grit air pump in sequence using the three (3) solenoid valves. Grit air pump solenoids are controlled after a cycle is initiated by the master grit sequencer.

The opening and closing periods of the solenoids are as on the process description above. The periods shall be adjustable through the "Operator interface Graphics."

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N08** and listed in part **3.08** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on the **OIS**. Verify that required status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED: None

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 02-CS-084A - Grit Classifier OIS man/auto switch ☐ Checked if approved
- 02-CS-084B - Grit Classifier OIS start/stop switch ☐ Checked if approved
- 02-KIC-084 - Master grit sequencer ☐ Checked if approved
- 02-KY-084 - Grit classifier run controller ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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GRIT REMOVAL – GRIT CLASSIFIER

EQUIPMENT NO.: 02-GCL-001, 02-LSH-084, 02-WHS-084, 02-SSL-084

DRAWING NO.: N08

PROCESS DESCRIPTION: Grit pumped from the aerated grit chamber is washed in the grit classifier to remove organic material that is recycled to the plant influent.

LOCAL CONTROL: Provide LOCAL/OFF/REMOTE switch for the grit classifier. When switch is in LOCAL, START classifier locally. When switch is OFF, the classifier is controlled by the PLC.

MCC FUNCTIONS: Annunciate mechanism RUN, HIGH TORQUE, ZERO SPEED, and HIGH WATER LEVEL alarms.

Provide classifier RESET switch.

Provide RUN indication.

PLC FUNCTIONS: Accumulate, indicate, and store running time for the grit classifier motor.

Annunciate mechanism RUN, HIGH TORQUE, ZERO SPEED, and HIGH WATERLEVEL alarms.

When the solenoid valves open (02-SOV-001, 02-SOV-002, 02-SOV-003) indicating that grit is coming to the classifier, START the classifier. Run the classifier while flow is coming and for 5 minutes after flow has stopped.

Upon reaching HIGH WATER LEVEL (02-LSH-84), close the three grit pump solenoid valves shut down the grit classifier and alarm.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N08** and listed in part **3.09** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on the **OIS** and MCC. Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 02-LAH-084 - Grit classifier high level ☐ Checked if approved
- 02-SAL-084 - Grit classifier zero speed ☐ Checked if approved
- 02-YA-084 - Grit classifier overload ☐ Checked if approved
- 02-WAH-084 - Grit classifier high motor torque ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 02-YL-084A - Grit classifier remote ☐ Checked if approved
- 02-YL-084B - Grit classifier run ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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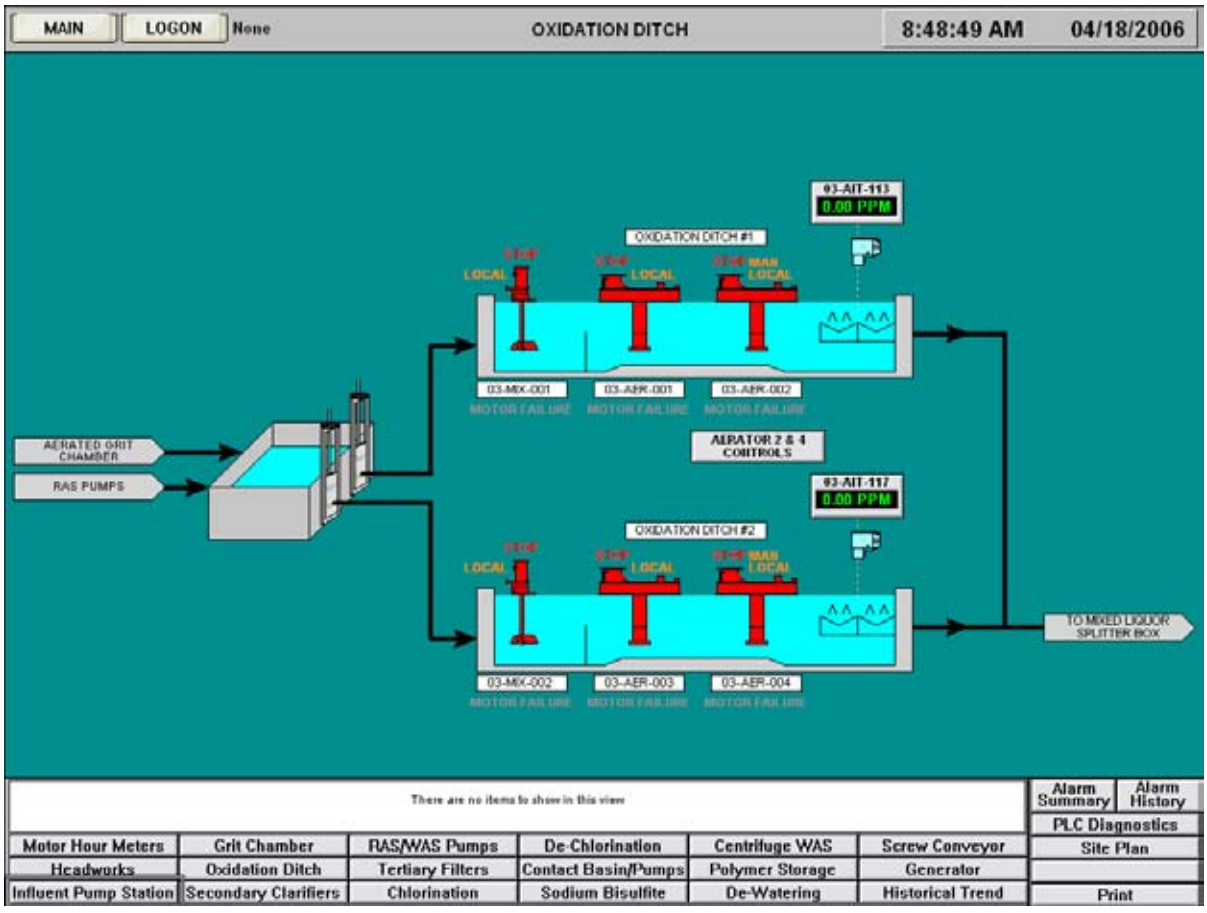
4.4 OXIDATION DITCH – ANOXIC MIXER



OXIDATION DITCH – ANOXIC MIXERS

EQUIPMENT NO.: 03-MXR-001, 03-MXR-003

DRAWING NO.: N09

PROCESS DESCRIPTION: Anoxic Mixers provide mixing in the anoxic zone of the Oxidation Ditches to facilitate de-nitrification. Each mixer is operated at constant speed when the oxidation ditch is in service

LOCAL CONTROL: Provide LOR selector and START/LOCKOUT/STOP control at each mixer.

MCC FUNCTIONS: Provide running indications, alarms, and alarm protection RESET switches as indicated on Drawing N09.

Provide RUNNING indication lights.

Provide high motor temperature, low oil level, and overload alarm status.

High motor temperature or low oil level shall shutdown the mixer.

PLC FUNCTIONS: Provide START/STOP OIS indication.

Provide REMOTE and RUNNING OIS indication.

Provide fail status ALARM and RUN-TIME METER.

COMPONENTS: The speed reducing gearbox is equipped with a low oil level switch device. The electric motor is equipped with thermostatic heat protection and a suitable sized space heater.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N09** and listed in part **3.10** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on the **OIS** and MCC. Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 03-YA-111 - Anoxic mixer #1 fail ☐ Checked if approved
- 03-YA-114 - Anoxic mixer #2 fail ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 03-CS-111 - Anoxic mixer #1 OIS start/stop switch ☐ Checked if approved
- 03-YL-111A - Anoxic mixer #1 remote ☐ Checked if approved
- 03-YL-111B - Anoxic mixer #1 run ☐ Checked if approved
- 03-CS-114 - Anoxic mixer #2 OIS start/stop switch ☐ Checked if approved
- 03-YL-114A - Anoxic mixer #2 remote ☐ Checked if approved
- 03-YL-114B - Anoxic mixer #2 run ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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OXIDATION DITCH – AERATORS

EQUIPMENT NO.: 03-AER-001, 03-AER-002, 03-AER-003, 03-AER-004, 03-AIT-113 (DO),
03-AIT-117 (DO)

DRAWING NO.: N09

PROCESS DESCRIPTION: Aerators provide oxygen, mixer, and propulsion for the mixed liquor in the channel. Each aerator has two speed settings, the second aerator of each ditch. Nos. 002 and 004, shall operate both manually and automatically based upon dissolved oxygen levels.

LOCAL CONTROL: Provide START/LOCKOUT/STOP control at each aerator.

Provide LOCAL/OFF/REMOTE selector, FAST START/SLOW START/STOP selector.

MCC FUNCTIONS: Provide "FAST RUN" and "SLOW RUN" status indication lights.

Provide high motor temperature, low oil flow, and overload alarm status and alarm reset.

High motor temperature or low oil flow shall shutdown the aerator.

PLC FUNCTIONS: Provide START/HIGH, START/LOW, SROP, and MANUAL/AUTO select for OIS operation.

Provide HIGH speed, LOW speed, and OFF OIS indication.

Provide fail status ALARM and RUN-TIME METER.

Provide automatic ON/OFF of 03-AER-002 and 03-AER-004 with signal from 03-AIT-113 or

03-AIT-117. if D.O. is less than 2.0 mg/L aerators to be on. If D.O. is greater than 2.0 mg/L plus an operator adjustable Deadband, aerators shall be shutoff.

COMPONENTS: The speed reducing gearbox is equipped with a low oil pressure cut-out switch. The electric motor is equipped with thermostatic heat protection and a 102V space heater.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N09** and listed in part **3.11** of the Process Control Description.

TESTING PROCEDURE: Introduce known concentrations of testing liquid to each instrument listed above. Verify readings of each instrument on **OIS**. Run all equipment listed above and verify each control and indication provided on the **OIS** and MCC. Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 03-YA-112 - Mechanical aerator #1 fail ☐ Checked if approved
- 03-YA-113 - Mechanical aerator #2 fail ☐ Checked if approved
- 03-YA-115 - Mechanical aerator #3 fail ☐ Checked if approved
- 03-YA-116 - Mechanical aerator #4 fail ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 03-CS-112 - Mechanical aerator #1 OIS fast/slow switch ☐ Checked if approved
- 03-YL-112A - Mechanical aerator #1 run fast ☐ Checked if approved
- 03-YL-112B - Mechanical aerator #1 run slow ☐ Checked if approved
- 03-YL-112C - Mechanical aerator #1 remote ☐ Checked if approved
- 03-AI-113 - Oxidation ditch #1 D.O. analyzer - (0-8 PPM) ☐ Checked if approved
- 03-ASL-113 - Oxidation ditch #1 D.O. Lo alarm ☐ Checked if approved
- 03-ASH-113 - Oxidation ditch #1 D.O. Hi alarm ☐ Checked if approved
- 03-CS-113A - Mechanical aerator #2 OIS man/auto switch ☐ Checked if approved
- 03-CS-113B - Mechanical aerator #2 OIS fast/slow switch ☐ Checked if approved
- 03-KY-113A - Aerator #2 D.O. OIS Hi start level ☐ Checked if approved
- 03-KY-113B - Aerator #2 D.O. OIS Lo stop level ☐ Checked if approved
- 03-YL-113A -Mechanical aerator #2 run fast ☐ Checked if approved
- 03-YL-113B - Mechanical aerator #2 run slow ☐ Checked if approved
- 03-YL-113C - Mechanical aerator #2 remote ☐ Checked if approved
- 03-CS-115 - Mechanical aerator #3 OIS fast/slow switch ☐ Checked if approved
- 03-YL-115A - Mechanical aerator #3 run fast ☐ Checked if approved
- 03-YL-115B - Mechanical aerator #3 run slow ☐ Checked if approved
- 03-YL-115C - Mechanical aerator #3 remote ☐ Checked if approved
- 03-CS-116A - Mechanical aerator #4 OIS man/auto switch ☐ Checked if approved
- 03-CS-116B - Mechanical aerator #2 OIS fast/slow switch ☐ Checked if approved
- 03-KY-116A - Aerator #4 D.O. OIS Hi start level ☐ Checked if approved

- 03-KY-116B - Aerator #4 D.O. OIS Lo stop level ☐ Checked if approved
- 03-YL-116A - Mechanical aerator #4 run fast ☐ Checked if approved
- 03-YL-116B - Mechanical aerator #4 run slow ☐ Checked if approved
- 03-YL-116C - Mechanical aerator #4 remote ☐ Checked if approved
- 03-AI-117 - Oxidation ditch #2 D.O. analyzer - (0-8 PPM) ☐ Checked if approved
- 03-ASL-117 - Oxidation ditch #2 D.O. Lo alarm ☐ Checked if approved
- 03-ASH-117 - Oxidation ditch #2 D.O. Hi alarm ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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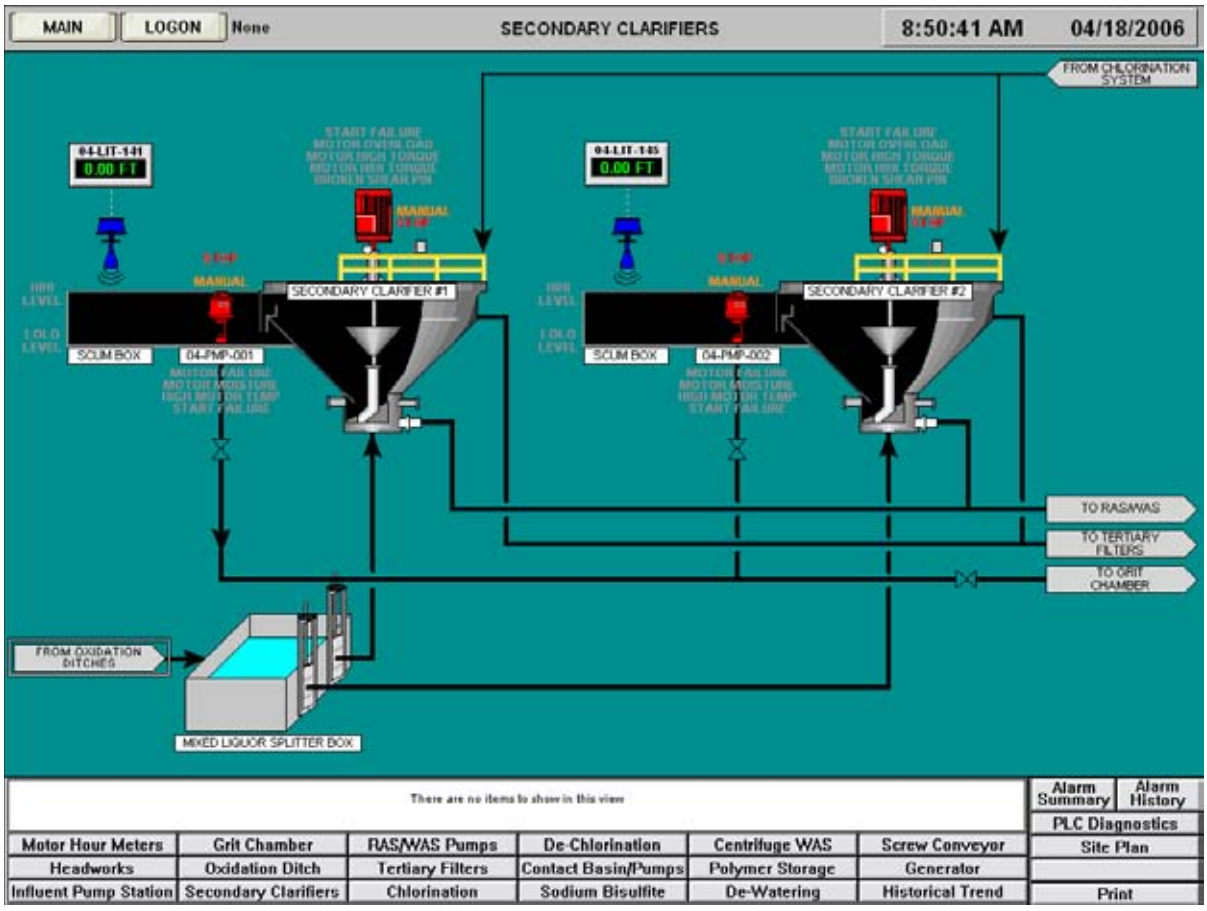
4.5 SECONDARY CLARIFIERS - SUBMERSIBLE SCUM PUMPS



SECONDARY CLARIFIERS – SUBMERSIBLE SCUM PUMPS

EQUIPMENT NO.: 04-PMP-001, 04-PMP-002, 04-LIT-141, 04-LIT-145, 04-LSLL-142, 04-LSLL-146

DRAWING NO.: N10

PROCESS DESCRIPTION: Floating material within thee secondary clarifier is skimmed from the surface into a box and pumped to the grit chamber. Submersible scum pump (04-PMP-001) shall pump scum from secondary clarifier No. 1 and submersible scum pump (04-PMP-002) shall pump scum from secondary clarifier No. 2

LOCAL CONTROL: Each pump shall have an LOR selector and SLOS switches. In the LOCAL position, the pump shall start via the field START switch. In the REMOTE position, the pump shall start and stop upon receiving START/STOP signal from the PLC. In the REMOTE/AUTO mode of operation, scum pump shall start and stop at the following level setpoint position.

The float switch setpoints shall be set as follows:

a) Low-Low level (LSLL)

b) Low level (Pump Stop) (LSL)

c) High Level (Pump Start) (LSH)

d) High-High Level (LSHH)

When either scum box reaches the pump start elevation, the scum pump shall start. When either scum box reaches the pump stop elevation, the pump shall stop. The PLC shall alarm the high-high or low-low conditions in both secondary scum boxes.

Pump RUNNING, FAIL and REMOTE (selected) signals shall be sent to the PLC.

MCC FUNCTIONS: Annunciate scum pump RUN indication and provide this signal to the PLC.

Provide scum pump moisture sensor and thermal overload indication to the PLC. Motor winding high temperature, moisture detected, and scum box level low low shall shutdown

PLC FUNCTIONS: START scum pump when scum pit level exceeds 201.0 feet elevation. STOP scum pump when scum pot level is less than 169.0 feet elevation. High level alarm switch to be set at 201.25 feet elevation. Low Low level alarm switch to be set at 195.75 feet elevation.

The PLC shall alarm the high-high or low-low level conditions in both secondary scum boxes.

Annunciate at the OIS: LOCAL/REMOTE mode, pump RUN indication, and pump overload alarm.

Accumulate, indicate, and store running time for the scum pump.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N10** and listed in part **3.12** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on the **OIS** and MCC. Float-type level switches can be verified by rotating the switch to the floating position. Ultrasonic level transmitters may be tested using an acoustically reflective piece of material (stiff cardboard, plywood, sheet metal, etc.) held at various distances from transmitters to simulate different liquid levels. Verify readings of each instrument on **OIS**. Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 04-LALL-141 - Scum box #1 LoLo level alarm ☐ Checked if approved
- 04-LAHH-141Scum box #1 HiHi level alarm ☐ Checked if approved
- 04-LALL-142 - Sec. Clarifier #1 scum box LOLO level ☐ Checked if approved
- 04-TAH-143 - Scum pump #1 high motor temp ☐ Checked if approved

- 04-XA-143 - Scum pump #1 moisture detected ☐ Checked if approved
- 04-YA-143 - Scum pump #1 overload ☐ Checked if approved
- 04-LALL-145 - Scum box #2 LoLo level alarm ☐ Checked if approved
- 04-LAHH-145 - Scum box #2 HiHi level alarm ☐ Checked if approved
- 04-LALL-146 - Sec. Clarifier #2 scum box LOLO level ☐ Checked if approved
- 04-TAH-147 - Scum pump #2 high motor temp ☐ Checked if approved
- 04-XA-147 - Scum pump #2 moisture detected ☐ Checked if approved
- 04-YA-147 - Scum pump #2 overload ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 04-LI-141 - Sec. Clarifier #1 scum box level transmitter ☐ Checked if approved
- 04-LSL-141 - Scum box #1 Lo level setpoint ☐ Checked if approved
- 04-LSH-141 - Scum box #1 Hi level setpoint ☐ Checked if approved
- 04-CS-143A - Scum pump #1 OIS man/auto switch ☐ Checked if approved
- 04-CS-143B - Scum pump #1 OIS start/stop switch ☐ Checked if approved
- 04-YL-143A - Scum pump #1 remote ☐ Checked if approved
- 04-YL-143B - Scum pump #1 run ☐ Checked if approved
- 04-LI-145 - Sec. Clarifier #2 scum box level transmitter ☐ Checked if approved
- 04-LSL-145 - Scum box #2 Lo level setpoint ☐ Checked if approved
- 04-LSH-145 - Scum box #2 Hi level setpoint ☐ Checked if approved
- 04-CS-147A - Scum pump #2 OIS man/auto switch ☐ Checked if approved
- 04-CS-147B - Scum pump #2 OIS start/stop switch ☐ Checked if approved
- 04-YL-147A - Scum pump #2 remote ☐ Checked if approved
- 04-YL-147B - Scum pump #2 run ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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SECONDARY CLARIFIERS – RAKE AND SKIMMER

EQUIPMENT NO.: 04-LCP-001, 04-DRV-001, 04-LCP-002, 04-DRV-002, 04-SOV-001, 04-SOV-002

DRAWING NO.: N10

PROCESS DESCRIPTION: The MLSS influent stream comes from the Mixed Liquor splitter box. Solids settle to the bottom of the clarifier and are removed as RAS/WAS, Clarified secondary effluent flows over the clarifier weirs and goes to filtration. Floating material is skimmed from the surface of the clarifier into a box and pumped to the Grit Chamber. The clarifier can be partially drained through the plant drain system to the influent pump station wet well.

LOCAL CONTROL: Provide START/LOCKOUT/STOP and LOCAL/OFF/REMOTE selector switch at the local control panel.

Monitor rake/skimmer mechanism torque. Upon 90 percent of rated torque, send HIGH TORQUE WARNING signal to the PLC and annunciate at LCP. Upon 100 percent of rated torque, shut down and lock out the rate/skimmer mechanism, annunciate on LCP, and send TORQUE OVERLOAD signal to the PLC. The rake skimmer mechanism lockout shall be maintained until the RESET pushbutton at the LCP is depressed.

Upon breakage of the rake/skimmer mechanism, shear pin, send a SHEAR PIN FAILURE signal to the PLC.

The skimmer mechanism shall trip a limit switch each rotation and initiate a plant water spray on the skimmer beach for an adjustable period (0 to 180onds, initially set at 60 seconds). The solenoid valve on the plant water pipeline will open when the limit switch is tripped. Provide a pushbutton near the scum well that also initiates the utility water spray.

Provide manual control of sodium hypochlorite solution and plant water at each secondary clarifier.

MCC FUNCTIONS: Annunciate mechanism RUN indication for secondary clarifier and provide this signal to the PLC.

Provide clarifier failure (thermal overload) indication for clarifier to PLC.

PLC FUNCTIONS: Provide START/STOP operation at OIS.

Provide REMOTE AND RUN indication at OIS.

Annunciate torque and overload alarms.

Accumulate, torque and store running time for the clarifier mechanism.

COMPONENTS: Torque switches and shear pin assembly to be provided by clarifier supplier

Provide skimmer plant water spray timer in LCP.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N10** and listed in part **3.13** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on Local Control Panels and the MCC. Verify that required alarms and

status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 04-WAH-144 - Secondary clarifiers #1 high motor torque ☐ Checked if approved
- 04-WAHH-144 Secondary clarifiers #1 HIHI motor torque ☐ Checked if approved
- 04-YA-144 - Secondary clarifiers #1 overload ☐ Checked if approved
- 04-ZAH-144 - Secondary clarifiers #1 shear pin broken ☐ Checked if approved
- 04-WAH-148 - Secondary clarifiers #2 - high motor torque ☐ Checked if approved
- 04-WAHH-148 - Secondary clarifiers #2 - HIHI motor torque ☐ Checked if approved
- 04-YA-148 - Secondary clarifiers #2 - overload ☐ Checked if approved
- 04-ZAH-148 - Secondary clarifiers #2 - shear pin broken ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 04-CS-144 - Sec. clarifier #1 OIS start/stop switch ☐ Checked if approved
- 04-YL-144A - Secondary clarifiers #1 remote ☐ Checked if approved
- 04-YL-144B - Secondary clarifiers #1 run ☐ Checked if approved
- 04-YL-144C - Secondary clarifiers #1 auto ☐ Checked if approved
- 04-CS-148 - Sec. clarifier #2 OIS start/stop switch ☐ Checked if approved
- 04-YL-148A - Secondary clarifiers #2 remote ☐ Checked if approved
- 04-YL-148B - Secondary clarifiers #2 run ☐ Checked if approved
- 04-YL-148C - Secondary clarifiers #2 auto ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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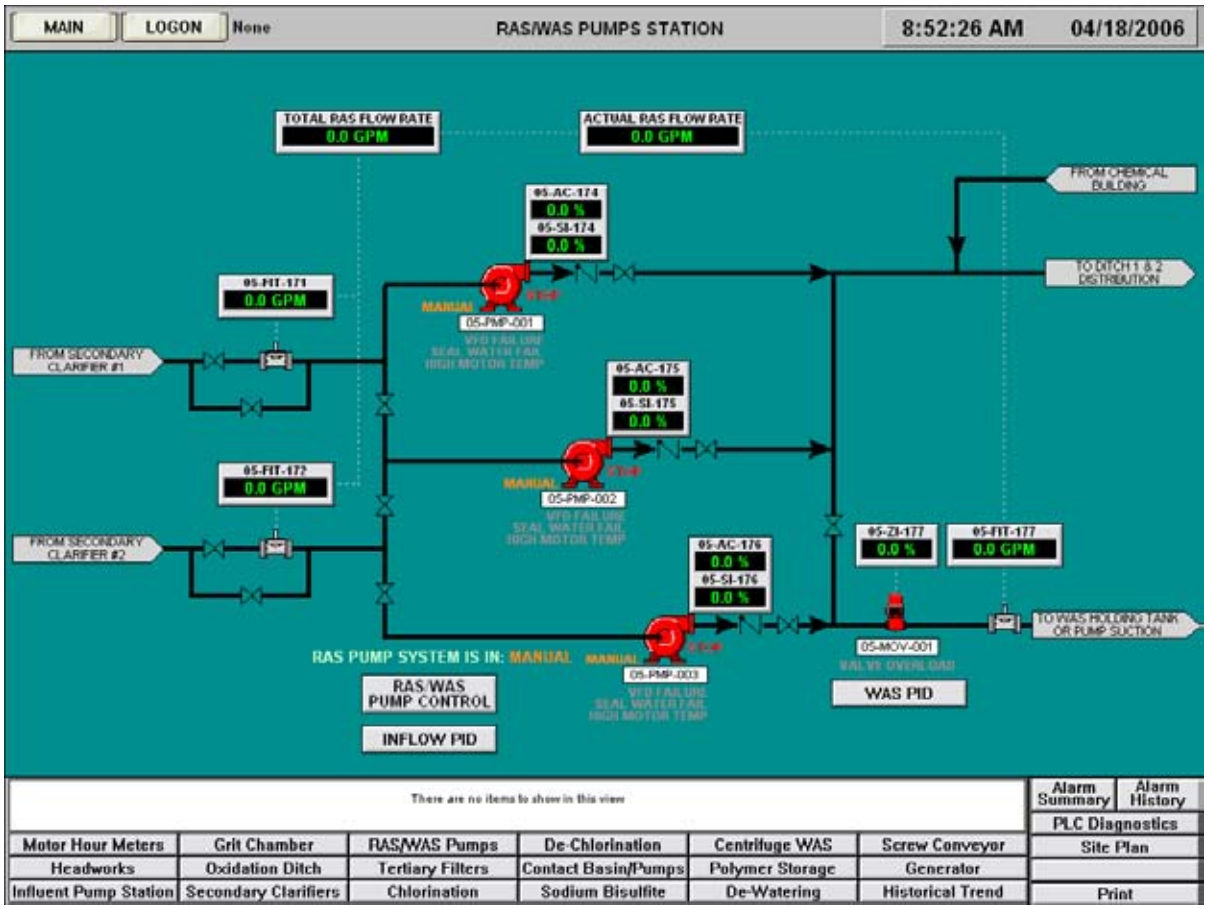
4.6 RAS/WAS PUMPS STATION



RAS/WAS PUMPS

EQUIPMENT NO.: 05-PMP-001, 05-PMP-002, 05-PMP-003, 05-FIT-171, 05-FIT-172, 05-FIT-177, 05-SOV-001, 05-SOV-002, 05-SOV-003

DRAWING NO.: N10

PROCESS DESCRIPTION: Returned Activated sludge (RAS) is pumped from the two secondary clarifiers to the oxidation ditch flow splitter box by a common RAS/WAS pump station. The pump station consists of three VFD controlled pumps. The individual flow from each clarifier is measured by one of two magnetic flow meters prior to reaching the pumps. The pump speed is modulated to maintain a set total RAS flow from the clarifiers. The total flow shall range from 410gpm to 790 gpm.
LOCAL CONTROL: Provide LOCKOUT/STOP.

MCC FUNCTIONS: Each variable speed pump shall have a LOCAL/REMOTE selector switch at the VFD. In the LOCAL position, the RAS/WAS pump shall start by a START/STOP switch and operate at the speed set by the VFD speed selector. When in the REMOTE position, the RAS/WAS pump shall start and operate at speed set by the PLC.

Provide RAS/WAS pump RUN indication.

Provide RAS/WAS pump REMOTE/RUN, VFD failure, motor temperature high and low seal water flow indication to the PLC.

Pump failure and low seal water flow shall shutdown the pumps.

PLC FUNCTIONS: Accumulate, indicate, and store running time for the RAS pump.

Monitor seal water to RAS/WAS pump and annunciate SEAL WATER FAIL upon failure.

Monitor total RAS flow rate. (Total of 05-FIT-171 and 05-FIT-172.)

Monitor total WAS flow rate. (05-FIT-177)

Monitor calculated actual RAS flow which is equal to the total RAS flow less the total WAS flow rate.

START and STOP the RAS pump in sequence (LEAD/LAG/STANDBY) and modulate the variable speed pumps to maintain set total flow from secondary clarifiers when the pump is selected as "REMOTE-AUTO."

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N11** and listed in part **3.14** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local VFD control panels. Calibrated flow meters can be verified by using a 4-20 mA signal generator at the PLC input to simulate various flow rates. Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 05-FAL-174 - RAS pump #1 seal water fail alarm ☐ Checked if approved
- 05-TAH-174 - RAS pump #1 motor temp Hi alarm ☐ Checked if approved
- 05-YA-174 - RAS pump #1 VFD fail alarm ☐ Checked if approved
- 05-FAL-175 - RAS pump #2 seal water fail alarm ☐ Checked if approved
- 05-TAH-175 - RAS pump #2 motor temp Hi alarm ☐ Checked if approved
- 05-YA-175 - RAS pump #2 VFD fail ☐ Checked if approved
- 05-FAL-176 - RAS pump #2 seal water fail ☐ Checked if approved
- 05-TAH-176 - RAS pump #3 high motor temp ☐ Checked if approved
- 05-YA-176 - RAS pump #3 VFD fail ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 05-FI-171 - RAS from sec. Clarifier #1 flow transmitter (0-2 MG/D ☐ Checked if approved
- 05-FI-172 - RAS from sec. Clarifier #2 flow transmitter (0-2 MG/D ☐ Checked if approved
- 05-FY-171 - RAS PLC flow combiner ☐ Checked if approved
- 05-CS-173 - RAS PLC pump sequencer ☐ Checked if approved
- 05-FIC-173 - RAS flow PID loop ☐ Checked if approved
- 05-AC-174 - RAS pump #1 speed reference ☐ Checked if approved

- 05-CS-174A - RAS pump #1 OIS man/auto switch ☐ Checked if approved
- 05-CS-174B - RAS pump #1 OIS start/stop switch ☐ Checked if approved
- 05-SI-174 - RAS pump #1 speed feedback ☐ Checked if approved
- 05-SIK-174 - RAS pump #1 manual speed controller ☐ Checked if approved
- 05-YL-174A - RAS pump #1 remote ☐ Checked if approved
- 05-YL-174B - RAS pump #1 run ☐ Checked if approved
- 05-AC-175 - RAS pump #2 speed reference ☐ Checked if approved
- 05-CS-175A - RAS pump #2 OIS man/auto switch ☐ Checked if approved
- 05-CS-175B - RAS pump #2 OIS start/stop switch ☐ Checked if approved
- 05-SI-175 - RAS pump #2 speed feedback ☐ Checked if approved
- 05-SIK-175 - RAS pump #2 manual speed controller ☐ Checked if approved
- 05-YL-175A - RAS pump #2 remote ☐ Checked if approved
- 05-YL-175B - RAS pump #2 run ☐ Checked if approved
- 05-AC-176 - RAS pump #3 speed reference ☐ Checked if approved
- 05-CS-176A - RAS pump #3 OIS man/auto switch ☐ Checked if approved
- 05-CS-176B - RAS pump #3 OIS start/stop switch ☐ Checked if approved
- 05-SI-176 - RAS pump #3 speed feedback ☐ Checked if approved
- 05-SIK-176 - RAS pump #3 manual speed controller ☐ Checked if approved
- 05-YL-176A - RAS pump #3 remote ☐ Checked if approved
- 05-YL-176B - RAS pump #3 run ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved
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TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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WAS MOTORIZED PLUG VALVE AND FLOW METER

EQUIPMENT NO.: 05-MOV-001, 05-FIT-177

DRAWING NO.: N11

PROCESS DESCRIPTION: The RAS/WAS pumps pump to a common RAS header. A 6 inch WAS discharge lone is connected to the header to allow WAS to flow through a 6 inch motorized plug valve followed by a 4 inch magnetic flow meter. The motorized plug valve followed by a 4 inch magnetic flow meter is provided for periodic wasting of sludge. When

the valve is opened, WAS is pumped to the WAS holding tank or directly to the suction side of the centrifuge feed pumps.

LOCAL CONTROL: The motorized plug valve shall have a LOCAL/REMOTE selector switch and "OPEN/STOP/CLOSE" selector.

PLC FUNCTIONS: In the REMOTE position, the valve will modulate to meet the flow rate set by the operator in 150 to 200 gpm.

Monitor and record WAS flow rate and volume wasted over time.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N11** and listed in part **3.15** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on the **OIS**. Calibrated flow meters can be verified by using a 4-20 mA signal generator at the PLC input to simulate various flow rates. Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 05-YA-177 - WAS FCV overload ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 05-AC-177 - WAS FCV position reference ☐ Checked if approved
- 05-FIC-177 - WAS flow PID controller ☐ Checked if approved
- 05-YL-177 - WAS FCV remote ☐ Checked if approved
- 05-ZI-177 - WAS FCV position feedback ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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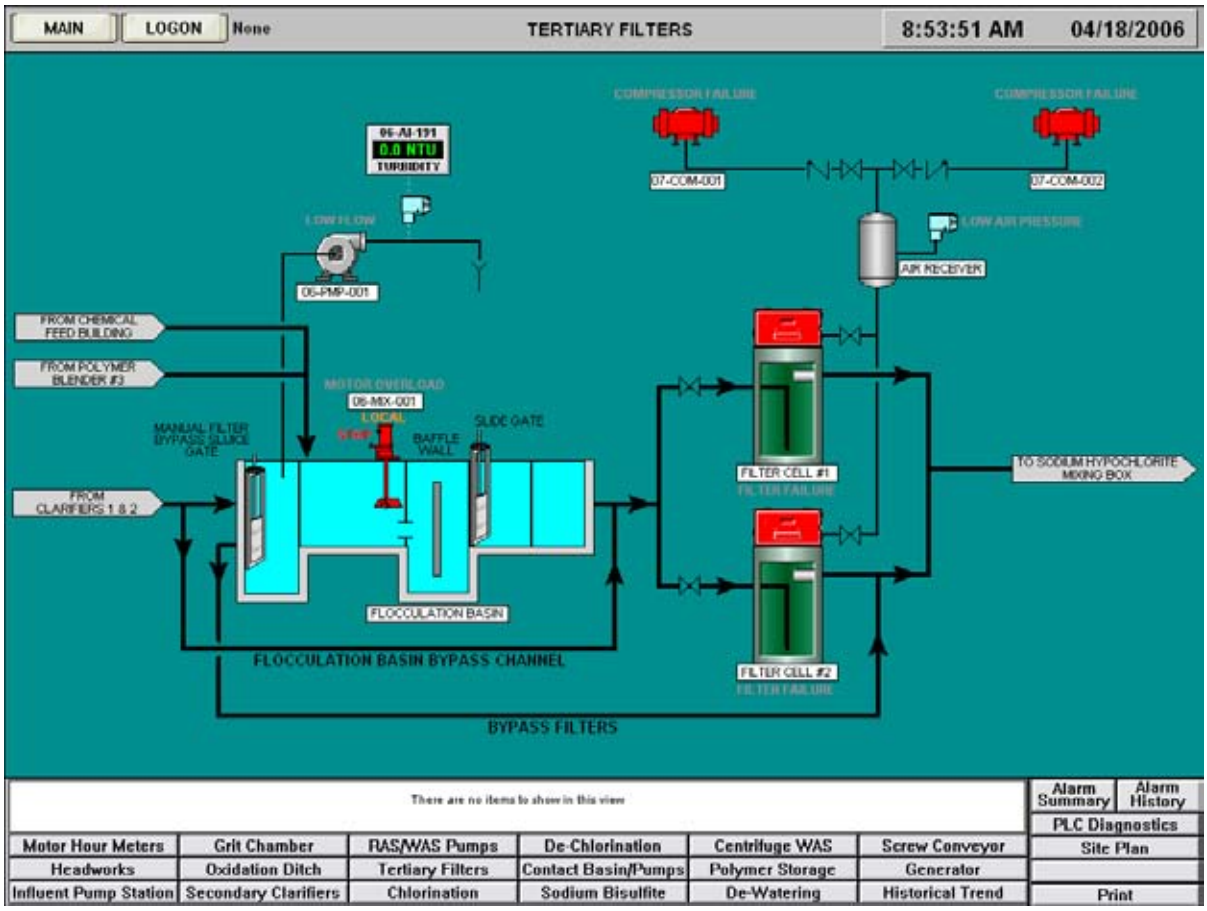
4.7 TERTIARY FILTERS– COAGULANT FLASH MIXERS



FILTER SYSTEM – COAGULANT FLASH MIXERS

EQUIPMENT NO.: 06-MIX-001, 06-PMP-001, 06-AI-191

DRAWING NO.: N11

PROCESS DESCRIPTION: Polymer is optionally added to secondary effluent before passing through flash mixer.

LOCAL CONTROL: The flash mixer shall have LOR selector and a three position START/LOCKOUT/STOP selector switch near the equipment. In the START position, the flash mixer shall RUN. The flash mixer will not run when the switch is in the LOCKOUT or STOP position.
MCC FUNCTIONS: Annunciate RUN indication and provide this signal to the PLC. Provide remote

PLC FUNCTIONS: START/STOP command when in remote mode.

Provide FAIL alarm and "running," "remote" status for flash mixer.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID**

N12 and listed in part **3.16** of the Process Control Description.

TESTING PROCEDURE: Introduce known concentrations of testing liquid to each instrument listed above. Run all equipment listed above and verify each control and indication provided on local MCC and the **OIS**. Verify that required alarms and status indicators are transmitted to **PLC-2** and are displayed on the **OIS**.

PLC-2 / OIS ALARMS TO BE VERIFIED:

- 06-YA-181 - Coagulant flash mixer overload ☐ Checked if approved

PLC-2 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 06-CS-181 - Coagulant flash mixer OIS start/stop switch ☐ Checked if approved
- 06-YL-181A - Coagulant flash mixer remote ☐ Checked if approved
- 06-YL-181B - Coagulant flash mixer run ☐ Checked if approved
- 06-AI-191 - Filter bypass channel turbidity transmitter ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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FILTER SYSTEM – FILTER CELLS

EQUIPMENT NO.: 06-LCP-001, 06-LCP-002

DRAWING NO. N12

PROCESS DESCRIPTION: Secondary effluent from both Clarifiers No. 1 and No. 2 is combined in a 30-inch diameter SE pipeline which enters the filter bypass channel. Under normal operations, a manual sluice gate will be opened to allow secondary effluent to pass through the flash mixer where polymer is added. Secondary effluent then passes through a baffled flocculation basin to the filter influent channel.
Manual butterfly valves will be open to allow secondary effluent to enter the continuous-backwash, up flow, deep-bed, granular filter media (sand) of the filters. The influent flows upward through the sand and the tertiary effluent over flows to a weir box and is delivered

to the hypochlorite mixing box.
Two local control panels will be provided by the manufacturer to control compressed air to the filters. A small volume of compressed air is introduced at the bottom of the air lift pipe in the center of the filters. The air rises and draws the sand media into the airlift and scours the sand as it rises in the airlift pipe.
Upon reaching the top of the airlift, the filtered material sand/air/water slurry spills over into a central reject compartment. The sand is returned to the sand bed through a washer/separator. As the sand falls through the washer, which consists of several concentric stages, a small amount of filtered water passes upward, washing away filtered material, while allowing the heavier course sand to fall back to the media bed.
The reject weir at the top of the unit is manually set at a lower level than the filter effluent weir box to provide a steady stream of backwash water. The rejected water continuously exits the filter to the plant drain system which discharges to the influent pump station wet well.

LOCAL CONTROL: Local controls provided by manufacturer in Local control panel (LCP). The manufacturer's panel controls includes air filters, solenoid valves, pressure regulators, and flow meters to control compressed air to the filter reject box of each of eight filter modules. Four filter modules are operated by one filter cell local control panel. Refer to Specification 11205 for filter system for more details.

MCC FUNCTIONS: Annunciate RUN and FAIL at the OIS.

PLC FUNCTIONS:

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N12** and listed in part **3.17** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local control panels and the **OIS**. Verify that required alarms and status indicators are transmitted to **PLC-2** and are displayed on the **OIS**.

PLC-2 / OIS ALARMS TO BE VERIFIED:

- 06-YA-182 - Tertiary filter cell #1 fail ☐ Checked if approved
- 06-YA-183 - Tertiary filter cell #2 fail ☐ Checked if approved

PLC-2 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 06-YL-182 - Tertiary filter cell #1 run ☐ Checked if approved
- 06-YL-183 - Tertiary filter cell #2 run ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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FILTER SUPPORT – PACKAGED AIR COMPRESSORS

EQUIPMENT NO.: 07-LCP-008, 07-COM-001, 07-COM-002, Air Receiver

DRAWING NO.: N12

PROCESS DESCRIPTION: The duplex air compressors supply compressed air for the tertiary filters.

LOCAL CONTROL: The packaged air compressor supplier shall provide a LCP that cycles the dual air compressors to maintain a receiver air pressure of approximately 120 psi. If the pressure drops below 110 psi, START the air compressor. If the pressure rises above 128 psi, STOP the compressor.
Annunciate air compressor RUN and FAIL indications and provide these signals to the PLC.
Alternate air compressors on ah adjustable period (0-30 days, default 7) by outputting a discrete ENABLE signal to each compressor LCP. If air pressure is below 80 psi, alternate air compressors. Do not alternate to a compressor not in AUTO mode.

COMPONENTS: Provide a purge valve on the air receiver to automatically drain condensate.

MCC FUNCTIONS: None

PLC FUNCTIONS: Provide alarms and indications as shown on Drawing N12.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N12** and listed in part **3.18** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local control panels and the **OIS**. Verify that required alarms and status indicators are transmitted to **PLC-2** and are displayed on the **OIS**.

PLC-2 / OIS ALARMS TO BE VERIFIED:

- 07-PALL-185 - Air receiver LOLO pressure ☐ Checked if approved
- 07-YA-187 - Air compressor #1 fail ☐ Checked if approved
- 07-YA-188 - Air compressor #2 fail ☐ Checked if approved

PLC-2 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 07-YL-187 - Air compressor #1 run ☐ Checked if approved
- 07-YL-188 - Air compressor #2 run ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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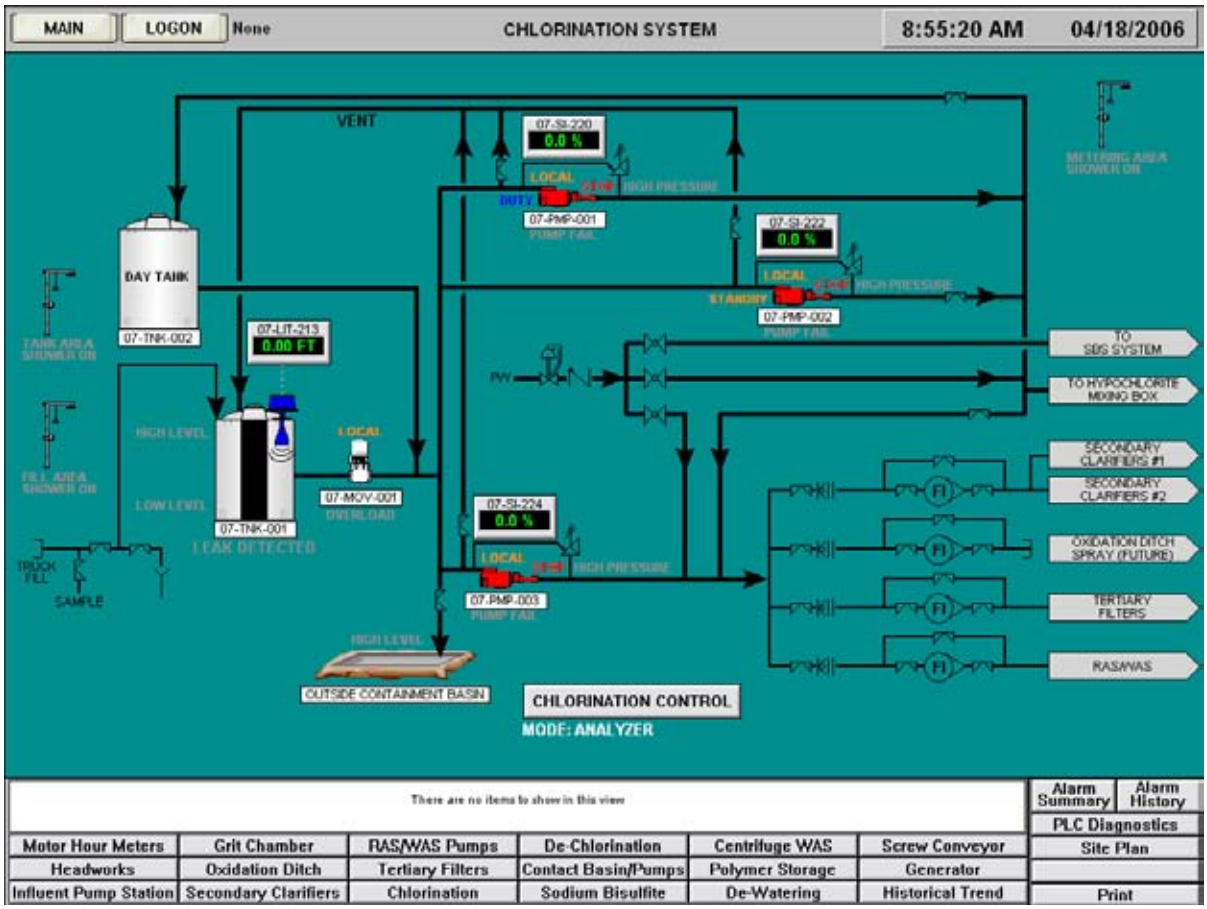
4.8 CHLORINATION SYSTEM– SODIUM HYPOCHLORITE STORAGE TANK AND SHUTOFF VALVE



CHEMICAL FEED – SODIUM HYPOCHLORITE STORAGE TANK AND SHUTOFF VALVE

EQUIPMENT NO.: 07-LCP-001, 07-TNK-001, 07-TNK-002, 07-LIT-213, 07-MOV-001, 07-FSH-211, 07-FSH-212

DRAWING NO.: N13

PROCESS DESCRIPTION: Sodium Hypochlorite (NaOCI) is used to disinfect the plant effluent and provide oxidation to other plant processes. Liquid sodium hypochlorite is trucked into the plant and pumped into the sodium hypochlorite storage tank 07-TNK-001. Day Tank 07-TNK-002 is for back-up operation only. Tank level is indicated on 07-LIT-213. A shutoff valve is either fully open or fully closed.

LOCAL CONTROL: If tank level is above 95 percent full (adjustable) or below 10 percent full (adjustable), an alarm horn associated with 07-LCP-001 is activated. The horn stays ON until the local SILENCE push button is activated or the tank level goes below the high-level alarm limit.
Provide LOR selector and OPEN/STOP/CLOSE local manual control for the shutoff valve. When the switch is placed in LOCAL mode, provide OPEN/CLOSE local manual control for the valves. When the switch is placed in REMOTE, the PLC will OPEN or CLOSE the shutoff valve.

Indicate shutoff valve OPENED and CLOSED condition.

MCC FUNCTIONS: None

PLC FUNCTIONS: Monitor tank level and calculate rate of change. If rate of change exceeds an adjustable parameter (0.00 to -0.10 ft/sec, default -0.04), indicating potential leak, alarm (YA-213) and CLOSE the corresponding shutoff valve.

OIS MANUAL CONTROL: Operator may OPEN or CLOSE hypochlorite storage tank shutoff valve.

The operator would typically OPEN the shutoff valve to place the tank in service. The operator would typically CLOSE the shutoff valve to place the tank out of service.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N13** and listed in part **3.19** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local control panels and the **OIS**. Calibrated level transmitters can be verified by using a 4-20 mA signal generator at the PLC input to simulate levels. Verify that required alarms and status indicators are transmitted to **PLC-2** and are displayed on the **OIS**.

PLC-2 / OIS ALARMS TO BE VERIFIED:

- 07-FAH-211 - NaOCI fill area eyewash on ☐ Checked if approved
- 07-FAH-212 - NaOCI tank area eyewash on ☐ Checked if approved
- 07-LAL-213 - NaOCI storage tank #1 level low ☐ Checked if approved
- 07-LAH-213 - NaOCI storage tank #1 level high ☐ Checked if approved
- 07-YA-213 - NaOCI storage tank #1 leak alarm ☐ Checked if approved

- 07-YA-214 - NaOCI isolation valve overload ☐ Checked if approved

PLC-2 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 07-LI-213 - NaOCI storage tank #1 level transmitter ☐ Checked if approved
- 07-CS-214 - NaOCI isolation valve OIS open/close switch ☐ Checked if approved
- 07-YL-214 - NaOCI isolation valve remote ☐ Checked if approved
- 07-ZLC-214 - NaOCI isolation valve is closed ☐ Checked if approved
- 07-ZLO-214 - NaOCI isolation valve is open ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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CHEMICAL FEED – EFFLUENT CHLORINE RESIDUAL CONTROL STRATEGY

EQUIPMENT NO.: 07-LCP-002, 07-LCP-003, 07-LCP-004, 07-PMP-001, 07-PMP-002, 08-FI-288, 08-AIT-270 (ORP), 07-PSH-221, 07-PSH-223, 07-PSH-225, 07-FSH-225

DRAWING NO.: N13, N15, N16
PROCESS DESCRIPTION: Sodium Hypochlorite (NaOCl) is mixed with the plant effluent to provide disinfection. Hypochlorite (SHS) flow rate shall be automatically controlled by flow proportioning or by closed loop ORP control.

LOCAL CONTROL: Refer to 07-LCP-002, 07-LCP-003 on N13 for local control functions.

INTERLOCK: "Discharge Pressure High" shall shutdown the pumps after time delay.

MCC FUNCTIONS: The hypochlorite feed pumps 07-PMP-001 and 07-PMP-002 shall run on a Duty-Standby sequence. Provide Duty-Standby selector at OIS. Provide AUTO/MANUAL mode of operation for pump controls

PLC FUNCTIONS: Provide two modes of automatic operation. A flow-proportioning mode shall pace the sodium hypochlorite feed rate based on the flow measured at the

tertiary effluent flow meter. Also, ORP control algorithm shall provide closed loop control of the chlorination process.

Transfer to automatic control shall be bumpless.

ORP ANALYZER controller

When in ORPANALYZER mode, use an OIS operator ORP setpoint within the range of 750-820 millivolts (mV) for a PID control loop. Use the pre-basin ORP (08-AIT-270) signal as the controller's measured variable. The ORP analyzer controller output shall be scaled 0-100% and represent the percentage of full output of the sodium hypochlorite pumping system. The PLC shall provide a 4-20 mA signal representative of the controller output to the sodium hypochlorite pumps.

Upon loss of ORP signal, the metering pump controller shall automatically switch to manual mode with a constant output equal to the last available value. Provide an alarm upon loss of the chlorine residual signal from 08-AI-267 or the loss of the ORP signal (08-AIT-270).

FLOW PROPORTIONING controller

When in FLOW PROPORTIONING mode, use and OIS operator entered parameter as the dosing rate input used to calculate the required hypochlorite feed rate using the equations below.

Use the filtered effluent flow rate (08-FIT-288) as the flow pacing signal.

In addition, the feed rate shall be adjusted based on the sodium hypochlorite solution concentration. An OIS entered hypochlorite solution strength (conc.) shall be used as shown below. The initial value shall be 0.12 (12 percent).

[1] (Flow, MGD) x (dosing rate, mg/L) x 8.34 (lbs/gal) = mass, lb/day

[2] (mass, lb/day) x (1 day/24 hours) x (1 gal./8.34 lb) x (1/conc.) = QCL2

[3] Q output (%) = (QCL2 / QCL2 at 100% speed)*100

[4] QCL2 at 100% speed shall be automatically determined based on a function provided by the pump manufacturer.

Upon loss of flow signal, the PLC shall substitute the flow measured by .the effluent flow signal 01-FI-30 and annunciate the loss of the flow signal.

OIS MANUAL CONTROL: The OIS operator can choose the FLOW PROPORTIONING control mode or the ANALYZER control mode.

When in FLOW PROPORTIONING mode, the OIS operator must enter a chlorine dosing rate in mg/L and a sodium hypochlorite solution concentration. The initial values shall be 8.0 mg/L and .12 (12%) respectively.

When in ORP ANALYZER control mode, the OIS operator must enter an ORP setpoint in mV. The initial value shall be 780mV. The OIS operator will manually adjust this setpoint to

maintain an acceptable level of chlorination in the plant effluent.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N13, N15, N16** and listed in part **3.20** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local control panels and the **OIS**. Introduce known concentrations of testing liquid to each instrument listed above. Calibrated flow transmitters can be verified by using a 4-20 mA signal generator at the PLC input to simulate various flows. Verify that required alarms and status indicators are transmitted to **PLC-2** and are displayed on the OIS.

PLC-2 / OIS ALARMS TO BE VERIFIED:

- 07-YA-220 - NaOCl pump #1fail ☐ Checked if approved
- 07-PAH-221 - NaOCl pump #1discharge high pressure ☐ Checked if approved
- 07-YA-222 - NaOCl pump #2fail ☐ Checked if approved
- 07-PAH-223 - NaOCl pump #2discharge high pressure ☐ Checked if approved
- 07-FAH-226 - NaOCl metering eyewash on ☐ Checked if approved

PLC-2 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 07-AIC-216 - Chlorination analyzer controller ☐ Checked if approved
- 07-HIK-216 - Chlorination analyzer ORP setpoint ☐ Checked if approved
- 07-CS-217 - Chlorination OIS flow pace/ORP switch ☐ Checked if approved
- 07-HIK-217 - Chlorination OIS dosing rate setpoint ☐ Checked if approved
- 07-FFIC-218 - Chlorination flow proportioning controller ☐ Checked if approved
- 07-CS-219A - Dosing pumps OIS man/auto switch ☐ Checked if approved
- 07-CS-219B - Dosing pumps OIS duty/standby switch ☐ Checked if approved
- 07-AC-220 - NaOCl pump #1 speed reference ☐ Checked if approved
- 07-CS-220 - NaOCl pump #1 OIS start/stop switch ☐ Checked if approved
- 07-FI-220 - NaOCl pump #1 OIS flow indicator ☐ Checked if approved
- 07-FIK-220 - NaOCl pump #1 OIS manual flow controller ☐ Checked if approved
- 07-SI-220 - NaOCl pump #1 speed feedback ☐ Checked if approved
- 07-YL-220A - NaOCl pump #1 remote ☐ Checked if approved
- 07-YL-220B - NaOCl pump #1 run ☐ Checked if approved
- 07-AC-222 - NaOCl pump #2 speed reference ☐ Checked if approved
- 07-CS-222 - NaOCl pump #2 OIS start/stop switch ☐ Checked if approved
- 07-FI-222 - NaOCl pump #2 OIS flow indicator ☐ Checked if approved
- 07-FIK-222 - NaOCl pump #2 OIS manual flow controller ☐ Checked if approved
- 07-SI-222 - NaOCl pump #2 speed feedback ☐ Checked if approved
- 07-YL-222A - NaOCl pump #2 remote ☐ Checked if approved
- 07-YL-222B - NaOCl pump #2 run ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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CHEMICAL FEED – HYPOCHLORITE SUPPORT METERING PUMP

EQUIPMENT NO.: 07-LCP-004, 07-PMP-003, 07-PSH-225

DRAWING NO.: N13
PROCESS DESCRIPTION: Through pump 07-PMP-003, Sodium Hypochlorite (NaOCl) Is applied at the secondary clarifiers, RAS discharge header and possibly to the oxidation ditch sprays and the filters, as required.

LOCAL CONTROL: Provide LOCAL/OFF/REMOTE control switch for the hypochlorite support metering pump. When the switch is placed in LOCAL mode, provide local manual control of the metering pump frequency and stroke length. When the switch is in the OFF position, the metering pump shall not operate. When the switch is placed in REMOTE, the PLC will provide stroke and frequency signals.

The flow from hypochlorite metering pump usually goes to the split board where rotometers are available to split the flow between the secondary clarifiers, the oxidation ditch spray, the filters, and/or the RAS discharge header.

Provide rotometers as shown on DWG N13.

INTERLOCK: Pump shall shutdown on high discharge pressure. If the high discharge pressure
switch (07-PSH-225) is activated, the metering pump will shut down and remain locked out until an operator or mechanic resets the pressure switch.

MCC FUNCTIONS: None

PLC FUNCTIONS: The PLC gets a manual flow setpoint from the OIS graphic. The PLC converts this flow setpoint in gallons per hour (gph) to an optimal stroke and frequency. The metering pump supplier shall provide the algorithm for this conversion.

OIS MANUAL CONTROL: If the hypochlorite support metering pump is in REMOTE mode, the OIS operator may send a flow rate signal in gph directly to the metering pump.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N13** and listed in part **3.21** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local control panels and the **OIS**. Verify that required alarms and status indicators are transmitted to **PLC-2** and are displayed on the **OIS**.

PLC-2 / OIS ALARMS TO BE VERIFIED:

- 07-YA-224 - NaOCl pump #3 fail ☐ Checked if approved
- 07-PAH-225 - NaOCl pump #3 discharge high pressure ☐ Checked if approved

PLC-2 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 07-AC-224 - NaOCl pump #3 speed reference ☐ Checked if approved
- 07-CS-224 - NaOCl pump #3 OIS start/stop switch ☐ Checked if approved
- 07-FI-224 - NaOCl pump #3 flow indicator ☐ Checked if approved
- 07-FIK-224 - NaOCl pump #3 manual flow controller ☐ Checked if approved
- 07-SI-224 - NaOCl pump #3 speed feedback ☐ Checked if approved
- 07-YL-224A - NaOCl pump #3 remote ☐ Checked if approved
- 07-YL-224B - NaOCl pump #3 run ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved
-

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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CHEMICAL FEED – SUMP LEVEL

EQUIPMENT NO.: 07-LSH-215

DRAWING NO.: N13

PROCESS DESCRIPTION: The chemical area sumps discharge the water collected in the sump to the storm water collection system through manual valving,

LOCAL CONTROL: None

MCC FUNCTIONS: None

PLC FUNCTIONS: A high level switch activates an alarm on the OIS graphic.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N13** and listed in part **3.22** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on the **OIS**. Float-type level switches can be verified by rotating the switch to the floating position. Verify that required alarms and status indicators are transmitted to **PLC-2** and are displayed on the **OIS**.

PLC-2 / OIS ALARMS TO BE VERIFIED:

- 07-LAH-215 - NaOCl containment basin high level ☐ Checked if approved

PLC-2 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED: None

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICATION) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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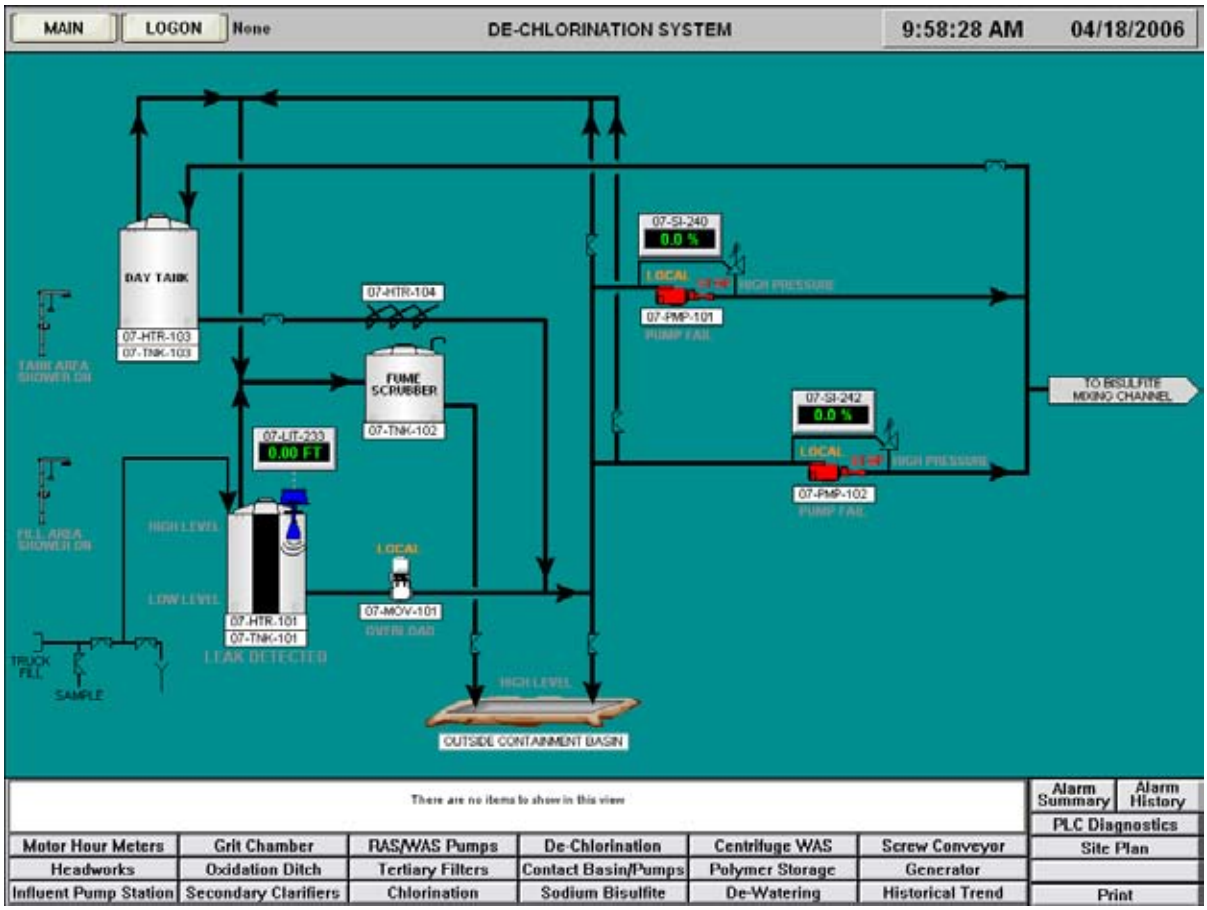
4.9 CHEMICAL FEED – SODIUM BISULFITE STORAGE TANK AND SHUTOFF VALVE



CHEMICAL FEED – SODIUM BISULFITE STORAGE TANK AND SHUTOFF VALVE

EQUIPMENT NO.: 07-LCP-005, 07-TNK-101, 07-TNK-103, 07-MOV-101, 07-FSH-231, 07-FSH-032

DRAWING NO.: N14

PROCESS DESCRIPTION: Sodium bisulfite (NaHSO3) solution is added to the chlorinated secondary effluent to neutralize the residual chlorine (dechlorinate) before being discharged. Liquid sodium bisulfite is trucked into the plant and pumped into the sodium bisulfite storage tank (07-TNK-101). Tank level is indicated on 07-LIT-233. Day tank 07-TNK-103 is for back-up operation only.

A shutoff valve is either fully open or fully closed.

LOCAL CONTROL: If tank level is above 95 percent full (adjustable) or below 10 percent full (adjustable), an alarm horn associated with 07-LCP-005 is activated. The horn stays ON until the local SILENCE push button is activated or the tank level goes below the high level alarm limit

Provide LOCAL/REMOTE and LOCKOUT/STOP local manual control for the shutoff valve. When the switch is placed in LOCAL mode, provide OPEN/CLOSE local manual control for the valve. When the switch is placed in REMOTE, the PLC will OPEN or CLOSE the shutoff valve.

Annunciate shutoff valve OPENED and CLOSED.

MCC FUNCTIONS: None

PLC FUNCTIONS: Monitor tank level and calculate rate of change. If rate of change exceeds an adjustable parameter (0.00 to -0.10 ft/sec, default -0.04), indicating potential leak, alarm (YA-233) and CLOSE the shutoff valve.

OIS MANUAL CONTROL: Operator may OPEN or CLOSE the sodium bisulfite storage tank shutoff valve.

The operator would typically OPEN the shutoff valve to place the tank in service. The operator would typically CLOSE the shutoff valve to place the tank out of service.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N14** and listed in part **3.23** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local control panels and the **OIS**. Verify that required alarms and status indicators are transmitted to **PLC-2** and are displayed on the **OIS**.

PLC-2 / OIS ALARMS TO BE VERIFIED:

- 07-FAH-231 - NaHS04 fill area eyewash on ☐ Checked if approved
- 07-FAH-232 - NaHS04 tank area eyewash on ☐ Checked if approved
- 07-LAL-233 - NaHS04 storage tank #1 level low ☐ Checked if approved
- 07-LAH-233 - NaHS04 storage tank #1 level high ☐ Checked if approved
- 07-YA-233- NaHS04 storage tank #1 leak alarm ☐ Checked if approved
- 07-YA-234 - NaHS04 isolation valve overload ☐ Checked if approved

PLC-2 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 07-LI-233 - NaHS04 storage tank #1 level (0-12FT) ☐ Checked if approved
- 07-CS-234 - NaHS04 OIS isolation valve open/close switch ☐ Checked if approved
- 07-YL-234 - NaHS04 isolation valve remote ☐ Checked if approved
- 07-ZLC-234 - NaHS04 isolation valve is closed ☐ Checked if approved
- 07-ZLO-234 - NaHS04 isolation valve is open ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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CHEMICAL FEED – DECHLORINATION CONTROL STRATEGY

EQUIPMENT NO.: 07-LCP-006, 07-LCP-007, 07-PMP-101, 08-FI-289, 08-AIT-268, 08-AIT-286, 07-LSH-235, 07-PSH-241, 07-PSH-243

DRAWING NO.: N12

PROCESS DESCRIPTION: Sodium bisulfite (NaHSO3) solution is added to the chlorinated secondary effluent to neutralize the residual chlorine (dechlorinate) before being discharged. Bisulfite flow rate may be automatically controlled by flow proportioning (dosage control) or concentration (analyzer control).

LOCAL CONTROL: Refer to 07-LCP-007 and 07-LCP-008 on DWG N14 Shutdown

MCC FUNCTIONS: The sodium bisulfite pumps shall run on a DUTY/STANDBY sequence. Provide DUTY/STANDBY selector at OIS. Provide AUTO/MANUAL mode of operation for pump control.

PLC FUNCTIONS: Provide two modes of automatic operation. A flow proportioning mode shall pace the sodium bisulfite feed rate based on the flow measured at the tertiary flow meter. Also, an ORP control algorithm shall provide closed loop control of the de-chlorination process.

Transfer to automatic control shall be bumpless.

ORP ANALYZER controller

When in ORP ANALYZER mode, use an OIS operator entered ORP setpoints within a range of 220-300 millivolts (mV) for a PID control loop. Use the post-chlorination ORP (08-AIT-286) signal as the controller's measured variable. The ORP analyzer controller output shall be scaled to 0-100% and represent the percent of full output of the sodium bisulfite pumping system. The PLC shall provide a 4-20 mA signal representative of the controller output to control the sodium bisulfite pumps

Upon loss of ORP signal, the metering pump controller shall automatically switch to manual mode with a constant output equal to the last available value. Provide an alarm upon loss of the chlorine residual signal from 08-AI-285 or the loss of the ORP signal (08-AIT-286).

FLOW PROPORTIONING controller

When in FLOW PROPORTIONONG mode, use an OIS operator entered value as the dosage rate used to calculate the required sodium bisulfite feed rate using the equations below. The initial value of the operator entered dosage rate shall be determined as follows: Dosage rate = 1.46*(Target residual chlorine + Experimentally determined bias) where 1.46 is a stoichiometric conversion factor relating sodium bisulfite to chlorine in the chlorine neutralization reaction. The experimentally determined bias shall be selected to prevent under-feeding sodium bisulfite under varying process conditions.

Use the filtered effluent flow rate (08-FIT-288) as the flow pacing signal.

In addition, the feed rate shall be adjusted based on the sodium bisulfite solution strength (concentration). An OIS operator entered sodium bisulfite concentration shall be used as shown below. The initial value shall be 0.40 (40%).

[1] (Flow, MGD) = 08-FI-288)

[2] (Flow, MGD) x (dosing rate, mg/L) x 8.34 = mass, lb/day

[3] (mass, lb/day) x (1 day/24 hours) x (1 gal./8.34 lb) x (1/conc.) = QSBS

[4] QOUTPUT(%) = (QSBS / QSBS at 100% Speed)*100

[5] QSBS at 100% Speed shall be automatically determined based on a function provided by the pump manufacturer.

Upon loss of effluent flow signal (08-FI-288) the PLC shall substitute 120 percent of the flow measured by the influent flow signal 01-FI-30 and annunciate loss of flow signal.

OIS MANUAL CONTROL: The OIS operator chooses the FLOW PROPORTIONING control mode or the ORP ANALYZER control mode.

When in FLOW PROPORTIONING mode, the OIS operator must enter a sodium bisulfite dosing rate in mg/L. The initial value shall be 12 mg/L. The OIS operator will manually adjust the dosage value (i.e. the bias) to maintain a small overdosing of sodium bisulfite and ensure a zero effluent chlorine residual concentration.

When in ORP ANALYZER control mode, the OIS operator must enter an ORP setpoint in mV. The initial value shall be 250 mV. The OIS operator will manually adjust this setpoint to maintain a zero chlorine residual in the plant effluent.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N14, 15, 16** and listed in part **3.24** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local control panels and the **OIS**. Introduce known concentrations of testing liquid to each instrument listed above. Calibrated flow transmitters can be verified by using a 4-20 mA signal generator at the PLC input to simulate various flows. Float-type level switches can be verified by rotating the switch to the floating position. Verify that required alarms and status indicators are transmitted to **PLC-2** and are displayed on the **OIS**.

PLC-2 / OIS ALARMS TO BE VERIFIED:

- 07-LAH-235 - NaHS04 containment basin high level ☐ Checked if approved
- 07-YA-240 - NaHS04 pump #1 fail ☐ Checked if approved
- 07-PAH-241 - NaHS04 pump #1 discharge high pressure ☐ Checked if approved
- 07-YA-242 - NaHS04 pump #2 fail ☐ Checked if approved
- 07-PAH-243 - NaHS04 pump #2 discharge high pressure ☐ Checked if approved

PLC-2 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 07-AIC-236 - De-chlorination analyzer controller ☐ Checked if approved
- 07-CS-237 - De-chlorination OIS flow pace/ORP switch ☐ Checked if approved
- 07-HIK-237 - De-chlorination OIS operator dosing rate ☐ Checked if approved
- 07-FFIC-238 - De-chlorination flow proportioning controller ☐ Checked if approved
- 07-CS-239A - Dosing pumps OIS man/auto switch ☐ Checked if approved
- 07-CS-239B - Dosing pumps OIS duty/standby switch ☐ Checked if approved
- 07-AC-240 - NaHS04 pump #1 speed reference ☐ Checked if approved
- 07-CS-240- NaHS04 pump #1 OIS start/stop switch ☐ Checked if approved
- 07-FI-240 - NaHS04 pump #1 flow indicator ☐ Checked if approved
- 07-FIK-240 - NaHS04 pump #1 OIS manual flow setpoint ☐ Checked if approved
- 07-SI-240 - NaHS04 pump #1 speed feedback ☐ Checked if approved
- 07-YL-240A - NaHS04 pump #1 remote ☐ Checked if approved
- 07-YL-240B - NaHS04 pump #1 run ☐ Checked if approved
- 07-AC-242 - NaHS04 pump #2 speed reference ☐ Checked if approved
- 07-CS-242 - NaHS04 pump #2 OIS start/stop switch ☐ Checked if approved
- 07-FI-242 - NaHS04 pump #2 flow indicator ☐ Checked if approved
- 07-FIK-242 - NaHS04 pump #2 OIS manual flow setpoint ☐ Checked if approved
- 07-SI-242 - NaHS04 pump #2 speed feedback ☐ Checked if approved
- 07-YL-242A - NaHS04 pump #2 remote ☐ Checked if approved
- 07-YL-242B - NaHS04 pump #2 run ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

CHEMICAL FEED – HEAT TRACING

EQUIPMENT NO.: 07-HTR-101, 07-HTR-102, 07-HTR-103, 07-HTR-104, 07-TC-244, 07-TC-245, 07-TC-246, 07-TC-247

DRAWING NO.: N14

PROCESS DESCRIPTION: Heat tracing is provided for the bisulfite tank and chemical piping. The purpose of the heat tracing is to prevent the concentrated sodium bisulfite solution from crystallizing in cold weather and prevent the piping from freezing.

LOCAL CONTROL: If the outside temperature falls below a preset temperature (50 degrees F), power the heat tracing.

MCC FUNCTIONS: None

PLC FUNCTIONS: None

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N14** and listed in part **3.25** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local control panels and the **OIS**.

PLC-2 / OIS ALARMS TO BE VERIFIED: None

PLC-2 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED: None

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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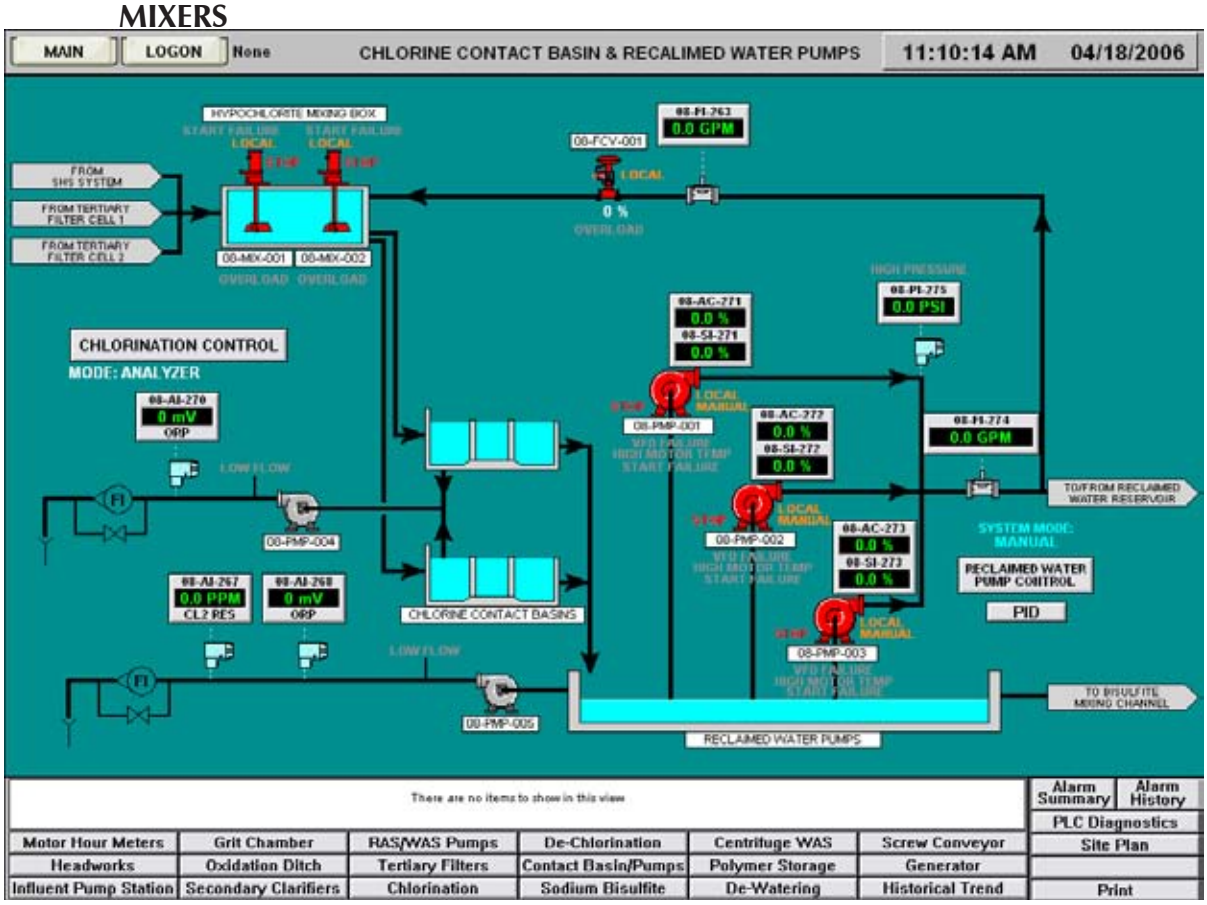
4.10 HYPOCHLORITE MIXING BOX – HYPOCHLORITE INDUCTION MIXERS



HYPOCHLORITE MIXING BOX – HYPOCHLORITE INDUCTION MIXERS

EQUIPMENT NO.: 08-MIX-001, 08-MIX-002

DRAWING NO.: 12

PROCESS DESCRIPTION: Hypochlorite solution Is added to the filtered effluent in the hypochlorite mixing box before passing to the two parallel chlorine contact basins. Two induction mixers are to be provided. One will operate and the second will be a standby unit. One unit will provide mixing before the chlorine contact basins to evenly disperse the chlorine' solution throughout the filtered tertiary effluent. Mixing increases microbiological kill and decreases the dosage of chlorine needed to achieve a given level of kill.

LOCAL CONTROL: Each induction mixer shall have LOR and a LOR/START/STOP and LOCKOUT/STOP pushbuttons near the equipment. In the START position, the flash mixer shall RUN. The flash mixer will not run when the switch is in the LOCKOUT or STOP position.
MCC FUNCTIONS: Provide "running" light.

PLC FUNCTIONS: Provide remote start and stop of mixers when they are in "remote" mode.

Provide "remote" and "running" indication and "overload" alarms.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on P&ID N15 and listed in part 3.26 of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on MCC's and the OIS. Verify that required alarms and status indicators are transmitted to PLC-2 and are displayed on the OIS.

PLC-2 / OIS ALARMS TO BE VERIFIED:

- 08-YA-261 - HYPO induction mixer #1 overload ☐ Checked if approved
- 08-YA-262 - HYPO induction mixer #2 overload ☐ Checked if approved

PLC-2 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 08-CS-261 - Mixer #1 OIS start/stop switch ☐ Checked if approved
- 08-YL-261A - HYPO induction mixer #1 remote ☐ Checked if approved
- 08-YL-261B - HYPO induction mixer #1 run ☐ Checked if approved
- 08-CS-262 - Mixer #2 OIS start/stop switch ☐ Checked if approved
- 08-YL-262A - HYPO induction mixer #2 remote ☐ Checked if approved
- 08-YL-262B - HYPO induction mixer #2 run ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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CHLORINE CONTACT BASIN – BISULFITE INDUCTION MIXER

EQUIPMENT NO.: 08-MIX-003, 08-MIX-004

DRAWING NO.: N16

PROCESS DESCRIPTION: Sodium bisulfite solution is added to the chlorinated filtered effluent to neutralize the residual chlorine (dechlorinate) before, being discharged. The induction mixer provides mixing to evenly disperse the bisulfite solution throughout the disinfected filtered effluent. The chemical reaction is very fast and is generally limited by mixing alone. Little detention time is required

LOCAL CONTROL: Two induction mixers are provided. One is a standby unit. If the duty unit has a failure, the operators will manually switch to the standby unit. Each induction mixer shall have a START/LOCKOUT/STOP selector switch near the equipment. In the START position, the mixer shall run. The mixer will not run when the switch is in the LOCKOUT or STOP position.

MCC FUNCTIONS: Provide "running" light.

PLC FUNCTIONS: Provide remote start and stop of mixer when they are in "remote" mode.

Provide "remote" and "running" indication and "overload" alarm.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N16** and listed in part 3.27 of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on MCC's and the **OIS**. Verify that required alarms and status indicators are transmitted to **PLC-2** and are displayed on the **OIS**.

PLC-2 / OIS ALARMS TO BE VERIFIED:

- 08-YA-281 - Bisulfate induction mixer #1 overload ☐ Checked if approved
- 08-YA-282 - Bisulfate induction mixer #2 overload ☐ Checked if approved

PLC-2 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 08-CS-281 - Mixer #1 OIS start/stop switch ☐ Checked if approved
- 08-YL-281A - Bisulfate induction mixer #1 remote ☐ Checked if approved
- 08-YL-281B - Bisulfate induction mixer #1 run ☐ Checked if approved
- 08-CS-282 - Mixer #2 OIS start/stop switch ☐ Checked if approved
- 08-YL-282A - Bisulfate induction mixer #1 remote ☐ Checked if approved
- 08-YL-282B - Bisulfate induction mixer #1 run ☐ Checked if approved
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CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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CHLORINE CONTACT BASIN – RECLAIMED WATER PUMPS AND RESERVOIR RETURN

EQUIPMENT NO.: 08-PMP-001, 08-PMP-002, 08-PMP-003, 08-FIT-274, 08-FIT-288, 08-FCV-001, 08-PIT-275, 08-AIT-267, 08-AIT-270

DRAWING NO.: N15

PROCESS DESCRIPTION: The purpose of the control strategy is to provide sequencing and speed control of the reclaimed water pumps. There are three identical variable frequency drives (VFD) reclaimed water pumps. The pumps share a common discharge manifold and deliver tertiary effluent to the existing reclaimed water reservoir.

The set point for the reclaimed water pumps will be controlled by the flow tag 08-FIT-288 after the chlorine contact basin. If the flow measured by the flow tag 08-FIT-288 is greater than the set point (0.80 cfs) then the reclaimed water pumps will pump to the reclaimed water reservoir. The NPDES permit requires that the WWTP discharge a minimum of 0.75 cfs to Chorro creek every 24 hours, seven days a week. During the nighttime hours (approximately 8:00 p.m. to 6:00 a.m.) wastewater flows can decrease considerably from daytime flows and can be less than 0.75 cfs. When the Parshall flume (08-FIT-288) indicates a flow less than the set point (0.80 cfs, to be positive that 0,75 cfs reaches the creek), the reclaimed water pumps will be interlocked in the OFF position.

When the flow In the Parshall flume reaches or goes below the low flow set point (0.80 cfs), the motorized butterfly valve (08-FCV-001) next to the hypochlorite mixing box will modulate open to maintain the set point flow of 08-FIT-288. The modulating valve will allow water from the reservoir to flow through the return line from the reservoir into the hypochlorite mixing box. The return flow from reservoir will be re-chlorinated and flow again through the chlorine contact basins.

Two of three pumps will be speed-controlled to maintain the flow set point in gpm from 08-FIT-274. The third pump will be a standby pump. The flow set points shall range from 460 to 920 gpm.
Provide additional two set points so that the low flow set point can be set for 1.20 cfs or higher during certain times of the year when more flow is required to be discharged to the creek

Each reclaimed water pump shall have a LOCKOUT/STOP selector switch at the pump

MCC ROOM (VFD PANEL): Each reclaimed water pump shall have an LOR selector switch and START/STOP pushbuttons at the VFD. In the LOCAL position, the pump shall START

and STOP and operate at the speed set by the VFD speed selector. When in the REMOTE position, the reclaimed water pumps shall start and operate at the flow set point indicated by 08-FIT-274 through the PLC.

Monitor the motor winding temperatures and provide VFD FAIL alarm.

Annunciate motor RUN indicator for the variable speed motor, and provide this signal to the PLC.

Send speed of VFD.

INTERLOCKS: Motor temperature high shall shutdown the motor. Discharge pressure high alarm stop all pumps. The alarm setpoint is 10 psi.

PLC FUNCTIONS: Automation sequence and speed control of the pumps shall be as indicated on the "process description" above and as shown on DWGN15.

Pumps shall shut off when flows registered by flow tag 08-FIT-288 drops below the setpoint.

Pumps shall shut off when the discharge line pressure is too high (08-PAH-275).

Provide pump speed, motor winding temperature high alarm, VFD for, and remote status.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N15** and listed in part **3.28** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local VFD control panels, MCC's and the **OIS**. Calibrated flow and pressure transmitters can be verified by using a 4-20 mA signal generator at the PLC input to simulate various flows and pressures. Verify that required alarms and status indicators are transmitted to **PLC-2** and are displayed on the **OIS**.

PLC-2 / OIS ALARMS TO BE VERIFIED:

- 08-YA-264 - HYPO reservoir return FCV overload ☐ Checked if approved
- 08-AAL-270 - Chlorine contact basin Lo ORP alarm ☐ Checked if approved
- 08-TAH-271 - Reclaim water pump #1 high temp ☐ Checked if approved
- 08-YA-271 - Reclaim water pump #1 fail ☐ Checked if approved
- 08-TAH-272 - Reclaim water pump #2 high temp ☐ Checked if approved
- 08-YA-272 - Reclaim water pump #2 fail ☐ Checked if approved
- 08-TAH-273 - Reclaim water pump #3 - high temp ☐ Checked if approved
- 08-YA-273 - Reclaim water pump #3 - fail ☐ Checked if approved
- 08-PAH-275 ☐ Checked if approved

PLC-2 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 08-AC-264 - HYPO reservoir return FCV position reference ☐ Checked if approved
- 08-YL-264 - HYPO reservoir return FCV remote ☐ Checked if approved
- 08-ZI-264 - HYPO reservoir return flow (0-20MG/D) ☐ Checked if approved
- 08-AI-267 - Reclaim water CL2 residue (0-20 PPM) ☐ Checked if approved
- 08-AI-270 - Chlorination water ORP (-400- +400mV) ☐ Checked if approved

- 08-AC-271 - Reclaim water pump #1 speed reference ☐ Checked if approved
- 08-CS-271A - Water pump #1 OIS man/auto switch ☐ Checked if approved
- 08-CS-271B - Water pump #1 OIS start/stop switch ☐ Checked if approved
- 08-SI-271 - Reclaim water pump #1 speed feedback ☐ Checked if approved
- 008-SIK-271 - Water pump #1 OIS manual speed setpoint ☐ Checked if approved
- 08-YL-271A - Reclaim water pump #1 remote ☐ Checked if approved
- 08-YL-271B - Reclaim water pump #1 run ☐ Checked if approved
- 08-AC-272 - Reclaim water pump #2 speed reference ☐ Checked if approved
- 08-CS-272A - Water pump #2 OIS man/auto switch ☐ Checked if approved
- 08-CS-272B - Water pump #2 OIS start/stop switch ☐ Checked if approved
- 08-SI-272 - Reclaim water pump #2 speed feedback ☐ Checked if approved
- 008-SIK-272 - Water pump #2 OIS manual speed setpoint ☐ Checked if approved
- 08-YL-272A - Reclaim water pump #2 remote ☐ Checked if approved
- 08-YL-272B - Reclaim water pump #2 run ☐ Checked if approved
- 08-AC-273 - Reclaim water pump #3 speed reference ☐ Checked if approved
- 08-CS-273A - Water pump #3 OIS man/auto switch ☐ Checked if approved
- 08-CS-273B - Water pump #3 OIS start/stop switch ☐ Checked if approved
- 08-SI-273 - Reclaim water pump #3 speed feedback ☐ Checked if approved
- 008-SIK-273 - Water pump #3 OIS manual speed setpoint ☐ Checked if approved
- 08-YL-273A - Reclaim water pump #3 remote ☐ Checked if approved
- 08-YL-273B - Reclaim water pump #3 fail ☐ Checked if approved
- 08-FIC-274 - Reclaim water flow control PID loop ☐ Checked if approved
- 08-PI-275 - Reclaim water pressure ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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CHLORINE CONTACT BASIN – EFFLUENT SAMPLING PUMPS

EQUIPMENT NO.: 08-PMP-004, 08-PMP-005, 08-PMP-006, 06-PMP-001, 06-FSL-190, 08-FSL-266, 08-FSL-276, 08-FSL-284

DRAWING NO.: N12, N15 and N16

PROCESS DESCRIPTION: The chlorine contact basin has a total of three effluent sampling pumps. These pumps discharge water collected at: 1) at the end of each of the first pass of the chlorine contact basin, 2) in the reclaimed water pump well, and 3) the exit of the bisulfate mixing chamber before the effluent Parshall flume and make it available to the chlorine analyzers. Pump Tag No. 08-PMP-004 will only pump to an ORP unit. Pump Tag No. 08-PMP-005 will provide sample for ORP and chlorine residual. 08-PMP-006 provides samples for ORP, chlorine residual, and turbidity analyzer. Pump Tag No. 06-PMP-001 will pump to turbidity analyzer.

LOCAL CONTROL: A local ON/OFF switch controls the chlorine contact basin effluent sampling pumps. When switched to ON, RUN the sample pump. When switched to OFF, STOP the sample pump.

MCC FUNCTIONS: None

PLC FUNCTIONS: Annunciate LOSS OF FLOW alarm for sample pumps.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID N12, 15, 16** and listed in part **3.29** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on MCC's. Verify that required alarms and status indicators are transmitted to **PLC-2** and are displayed on the **OIS**.

PLC-2 / OIS ALARMS TO BE VERIFIED:

- 06-FAL-190 Sec. clarifiers effluent sample pump low flow ☐ Checked if approved
- 08-FAL-266 Contact basin reclaim water sample low flow ☐ Checked if approved
- 08-FAL-276 Contact basin chlorination water sample low flow ☐ Checked if approved
- 08-FAL-284 Dechlorination water sample low flow ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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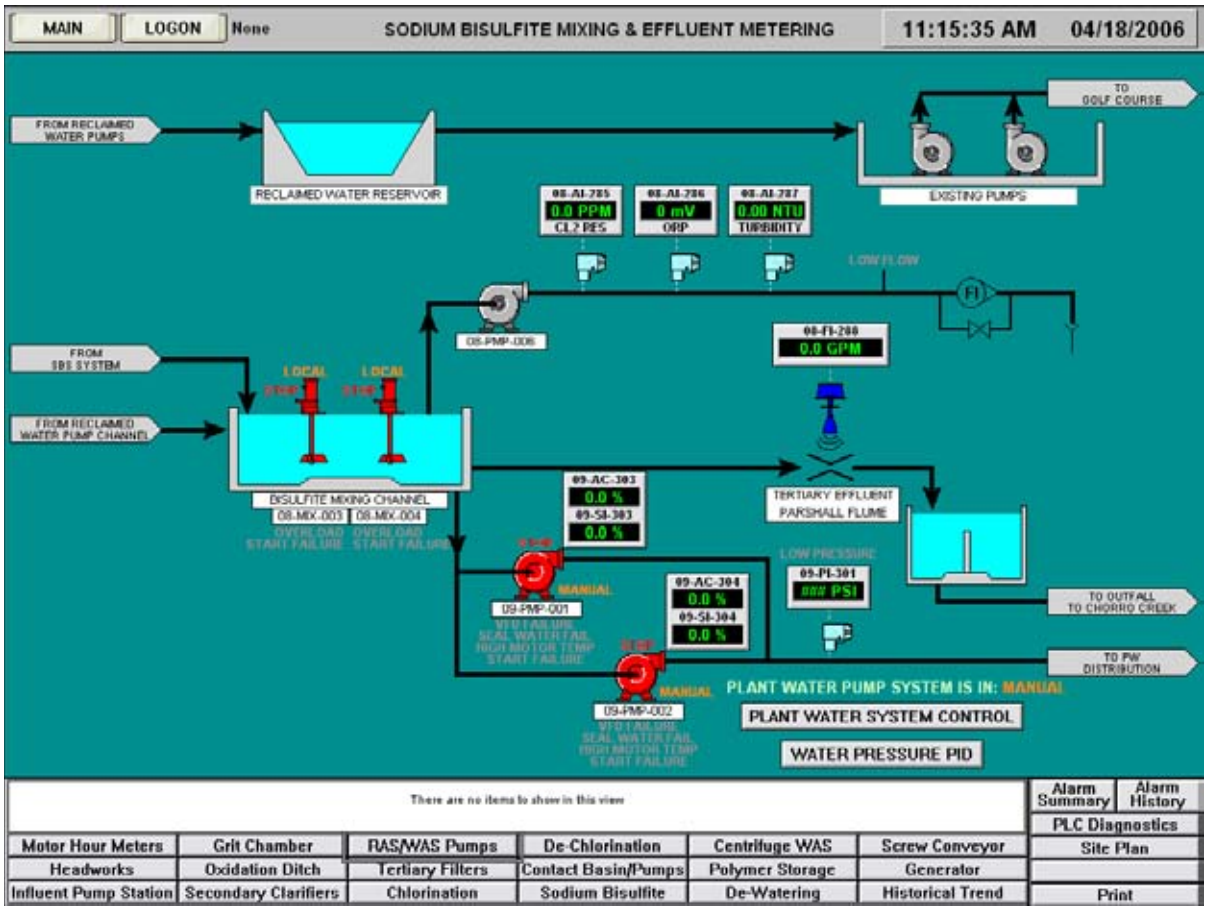
4.11 PLANT WATER PUMPS



PLANT WATER PUMPS

EQUIPMENT NO.: 09-PMP-001, 09-PMP-002, 09-PIT-301

DRAWING NO.: N17

PROCESS DESCRIPTION: The purpose of this control strategy is to provide sequencing and speed control of the plant water pumps. There are two identical variable frequency drive (VFD) plant water pumps.

The pumps share a common discharge manifold and are designed to supply a relatively' constant pressure of approximately 80 psi over a flow range of approximately 50 gpm to175gpm.

Each plant water pump shall have a LOCKOUT/STOP at the pump.
MCC ROOM (VFD): Each plant water pump shall have a LOR selector switch and START/ STOP push buttons at the VFD. In the LOCAL position, the pump shall START and STOP and operate at the speed set by the VFD speed selector. When in the REMOTE position, the plant water pump shall start and operate at the speed set by the PLC.

When in LOCAL mode, set the PLC speed output to the VFD equal to the pump speed

feedback input to ensure "bumpless" transfer from LOCAL control mode to REMOTE control mode.

Monitor the motor winding temperatures at the VFD.

Annunciate motor RUN indication for the variable speed motor and provide this signal to the PLC.

Send Speed of the VFD to PLC.

INTERLOCK: Shut off pump if seal water low flow switch is activated, and motor winding high temperature annunciator alarm.

PLC FUNCTIONS: Plant water pump discharge manifold pressure (09-PIT-301) shall be monitored by the PLC associated with the plant water pumps. The pressure signal shall be used to control the plant water pumps as follows:

If pressure indicator drops below 50 psi, annunciate alarm (PAL-301).

Pumps shall be speed-controlled to maintain a constant (adjustable) pressure, within an adjustable deadband. One of two pumps will operate with the second pump as a standby.

Provide automatic pump rotation such that the first pump ON is always the first pump OFF. Rotate pump starting sequence.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID 17** and listed in part **3.30** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local VFD control panels, MCC's and the **OIS**. Calibrated flow and pressure transmitters can be verified by using a 4-20 mA signal generator at the PLC input to simulate various flows and pressures. Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 09-PAL-301 - Plant water low pressure alarm ☐ Checked if approved
- 09-FAL-303 - Plant water pump #1 seal water fail ☐ Checked if approved
- 09-TAH-303 - Plant water pump #1 high motor temp ☐ Checked if approved
- 09-YA-303 - Plant water pump #1 VFD fail ☐ Checked if approved
- 09-FAL-304 - Plant water pump #2 seal water fail ☐ Checked if approved
- 09-TAH-304 - Plant water pump #2 high motor temp ☐ Checked if approved
- 09-YA-304 - Plant water pump #2 VFD fail ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 09-PIC-301 - Plant water pressure PID control loop ☐ Checked if approved
- 09-CS-302 - Plant water pumps OIS sequencer ☐ Checked if approved
- 09-AC-303 - Plant water pump #1 speed reference ☐ Checked if approved
- 09-CS-303A - Plant water pump #1 OIS man/auto switch ☐ Checked if approved
- 09-CS-303B - Plant water pump #1 OIS start/stop switch ☐ Checked if approved

- 09-SI-303 - Plant water pump #1 speed feedback ☐ Checked if approved
- 09-SIK-303 - Plant water pump #1 OIS manual speed setpoint ☐ Checked if approved
- 09-YL-303A - Plant water pump #1 remote ☐ Checked if approved
- 09-YL-303B - Plant water pump #1 run ☐ Checked if approved
- 09-AC-304 - Plant water pump #2 speed reference ☐ Checked if approved
- 09-CS-304A - Plant water pump #2 OIS man/auto switch ☐ Checked if approved
- 09-CS-304B - Plant water pump #2 OIS start/stop switch ☐ Checked if approved
- 09-SI-304 - Plant water pump #2 speed feedback ☐ Checked if approved
- 09-SIK-304 - Plant water pump #2 OIS manual speed setpoint ☐ Checked if approved
- 09-YL-304A - Plant water pump #2 remote ☐ Checked if approved
- 09-YL-304B - Plant water pump #2 run ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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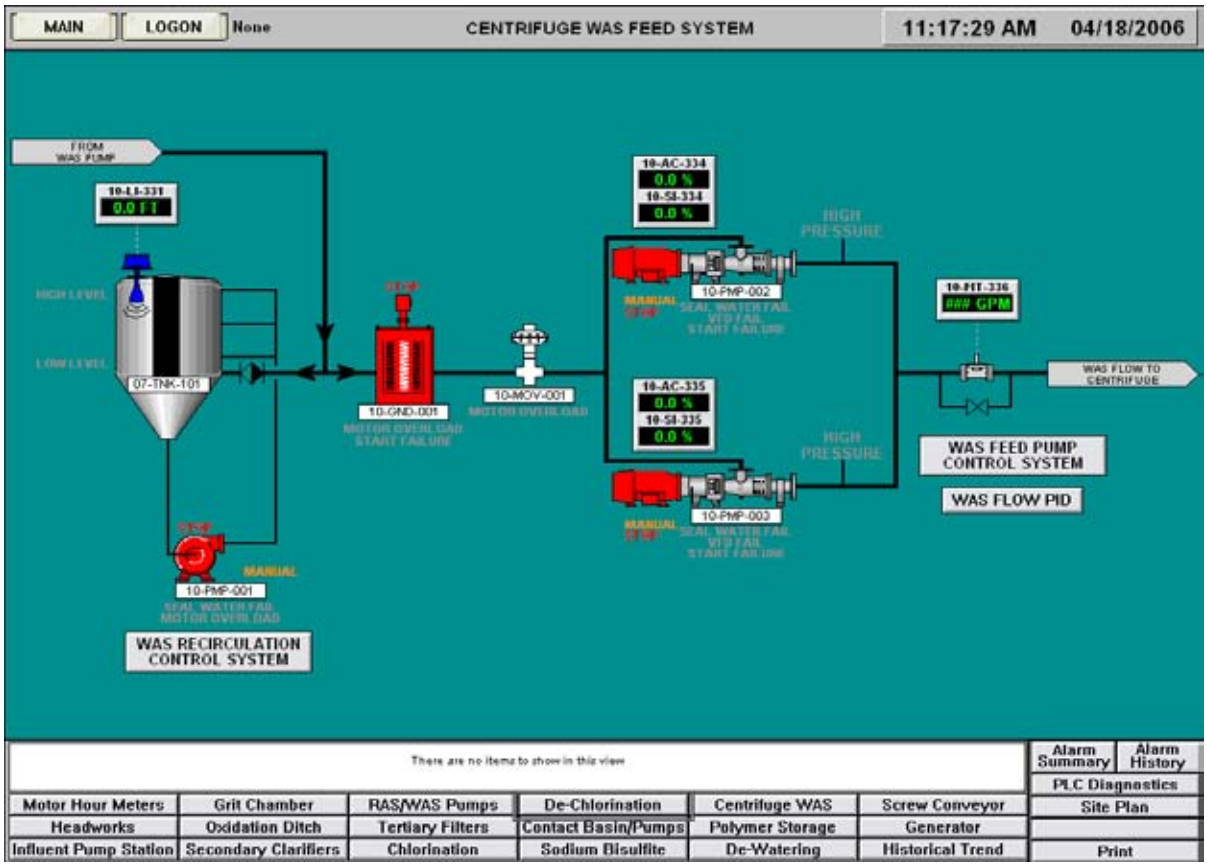
4.12 Solids – WAS Holding Tank



SOLIDS – WAS HOLDING TANK

EQUIPMENT NO.: 10-PMP-001, 10-FSL-332, 10-SOL-001, 10-LIT-331

DRAWING NO.: N18

PROCESS DESCRIPTION: Waste Activated Sludge (WAS) Is pumped from the secondary clarifiers through the RAS/WAS pumps to the WAS holding tank and/or directly fed to the WAS feed pump through 10-MOV-001. The sludge is held in the holding tanks until dewatered by centrifuges.

LOCAL CONTROL: The recirculation pump shall have a LOR selector switch at the LCP. In the LOCAL position, the pump shall START and STOP locally. When in the REMOTE position, the pump shall START and STOP as, controlled by the PLC. Provide START/ LOCKOUT/STOP near the pump.

MCC FUNCTIONS: Provide pump RUN indication locally and to the PLC.

Provide pump thermal overload OL indication to the PLC. Open seal water valve when pump starts. Seal water low flow switch shall shutdown the recirculation pump. Provide LOW FLOW alarm indicator at the MCC and to PLC

PLC FUNCTIONS: The REMOTE mode shall be further divided into REMOTE-MAN and

REMOTE-AUTO mode by the MANUAL-AUTO selector in the OIS graphic. In the REMOTE-MAN mode, the recirculating pump can be started individually by the graphic START/STOP command. In the REMOTE/AUTO mode, the recirculation pump shall be controlled by a pre-set timer for START/STOP. Equipment and level status and alarms are as shown on DWG N18. The holding tank LOW LEVEL alarm (LAL-331) shall stop the pump.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID 18** and listed in part **3.31** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on MCC's and the **OIS**. Calibrated level transmitters can be verified by using a 4-20 mA signal generator at the PLC input to simulate various levels. Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 10-LAL-331 - WAS holding tank Lo level ☐ Checked if approved
- 10-LAH-331 - Was holding tank Hi level ☐ Checked if approved
- 10-FAL-332 - WAS tank recirculation pump seal water fail ☐ Checked if approved
- 10-YA-332 - WAS tank recirculation pump overload ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 10-LI-331 - WAS tank level transmitter (0-40FT) ☐ Checked if approved
- 10-CS-332A - WAS recirculation pump OIS man/auto switch ☐ Checked if approved
- 10-CS-332B - WAS recirculation pump OIS start/stop switch ☐ Checked if approved
- 10-KC-332 - WAS recirculation pump OIS start/stop timer ☐ Checked if approved
- 10-YL-332A - WAS tank recirculation pump remote ☐ Checked if approved
- 10-YL-332B - WAS tank recirculation pump run ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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SOLIDS – CENTRIFUGE SLUDGE FEED GRINDER

EQUIPMENT NO.: 10-LCP-GCP, 10-GND-001, 10-MOV-001

DRAWING NO.: N18
PROCESS DESCRIPTION: The feed valve (OPEN/CLOSE type) conveys waste sludge to the centrifuge directly from the WAS pumps or from the WAS holding tank. A centrifuge sludge feed grinder grinds large particulate material in the sludge stream to prevent damage to downstream units.

LOCAL CONTROL: Provide LOR (LOCAL/OFF/REMOTE) control for the sludge grinder. When the switch is placed in LOCAL mode, provide START/STOP for the grinder. When the switch is placed in REMOTE. Grinder shall be started/stopped through the dewatering system START/STOP sequence. Provide REMOTE indication to PLC.

Annunciate OVERLOAD and provide this signal to the PLG.

Provide sludge grinder RUN status at the local control panel and to the PLC.

Provide LOCKOUT/STOP.

The centrifuge sludge feed grinder will not START unless the feed valve is OPEN and a centrifuge sludge feed pump is operating. The centrifuge sludge feed grinder will STOP when the operating centrifuge sludge feed pump stops.

Provide LOR selector switch for the WAS feed valve. When the switch is in LOCAL, the valve is controlled locally with the OPEN/STOP/CLOSE push buttons. When switch is in REMOTE, the valve is controlled by OPEN and CLOSE signals from the PLC. When in REMOTE, provide REMOTE indication to PLC. Provide valve OPEN and CLOSE position" indication to PLC. Annunciate OVERLOAD indication upon valve failure and provide actuator overload to the PLC.

MCC FUNCTIONS: NONE

PLC FUNCTIONS: When the OIS operator initiates a dewatering START sequence, OPEN feed valve. When the valve is fully OPEN, RUN centrifuge sludge feed grinder. STOP centrifuge sludge feed grinder if feed valve is not fully OPEN. Provide a FAIL TO OPEN alarm if valve takes more than an adjustable period of time (initially set at 120 seconds) to OPEN.

When OIS operator initiates a STOP sequence, STOP centrifuge sludge feed grinder and CLOSE feed valve. Provide a FAIL TO CLOSE alarm if valve takes more than an adjustable period of time (initially set at 120 seconds) to CLOSE.
Accumulate, indicate, and store running time for the centrifuge sludge feed grinder motor.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID 18** and listed in part **3.32** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local control panels, MCC's and the **OIS**. Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 10-YA-333 - Centrifuge sludge feed valve overload ☐ Checked if approved
- 10-YA-337 - Centrifuge sludge feed grinder overload ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 10-YL-333- Centrifuge sludge feed valve remote ☐ Checked if approved
- 10-ZLC-333 - Centrifuge sludge feed valve is closed ☐ Checked if approved
- 10-ZLO-333 - Centrifuge sludge feed valve is open ☐ Checked if approved
- 10-YL-337A - Centrifuge sludge feed grinder remote ☐ Checked if approved
- 10-YL-337B - Centrifuge sludge feed grinder run ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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SOLIDS – CENTRIFUGE SLUDGE FEED PUMPS

EQUIPMENT NO.: 10-PMP-002, 10-PMP-003, 10-SOV-002, 10-SOV-003, 10-PSH-334, 10-PSH-335, 10-FIT-336

DRAWING NO.: N18

PROCESS DESCRIPTION: Two variable speed driven progressing cavity feed pumps are provided to pump sludge to Centrifuge No. 1 and Centrifuge No. 2. The pumps will operate In a DUTY/STANDBY mode. The piping has been designed so that any pump may pump to any Centrifuge by opening and closing the appropriate valves.

LOCAL CONTROL: Provide LOR selector switch at the VFD. When the switch is placed in LOCAL mode, the feed pump shall start and operate at the speed set by the VFD speed selector. When in the REMOTE position, the feed pump shall start and operate at the speed set by the PLC.

Upon feed pump failure annunciate FAIL indication, shut down and lock out the BFP feed pump mechanism, annunciate on PLC.

Annunciate RUN indication and provide this signal to the PLC.

Provide LOCKOUT/STOP switch.

The DUTY and STANDBY pump shall automatically rotate at least once every 5 days (adjustable).

Plant water solenoid valve opens when pump starts. Annunciate FLOW LOW alarm after set time delay.

INTERLOCK: Discharge pressure high switch shuts down the pump and annunciates alarm at OIS.

MCC FUNCTIONS: None

PLC FUNCTIONS: START Sequence:

When the OIS operator initiates a dewatering system START sequence, START feed pump VFD at minimum speed.

If in SPEED mode, ramp up speed to meet setpoint If in FLOW mode, modulate speed to maintain flow setpoint.

STOP Sequence:

STOP centrifuge feed pump.

If the "DUTY' pump fails or is not available, the "standby" pump shall take its place.

Monitor and annunciate feed pump motor speed.

Annunciate and alarm SEAL WATER FAILURE and DISCHARGE PRESSURE HIGH alarm.

OIS MANUAL CONTROL: OIS operator may select centrifuge feed pump to RUN and initiate the
START sequence. OIS operator may initiate STOP sequence.

OIS operator may select SPEED or FLOW mode. When in SPEED mode, the operator enters a speed setpoint. When in FLOW mode, the operator enters a flow rate setpoint.

Operator may start and stop centrifuge feed pumps.

Accumulate, indicate, and store running time for the centrifuge feed pumps.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID 18** and listed in part **3.33** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on VFD control panels and the **OIS**. Calibrated flow transmitters can be verified by using a 4-20 mA signal generator at the PLC input to simulate various flow rates. Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 10-FAL-334 - WAS feed pump #1 seal water fail ☐ Checked if approved
- 10-PAH-334 - WAS feed pump #1 discharge high pressure ☐ Checked if approved
- 10-YA-334 - WAS feed pump #1 VFD fail ☐ Checked if approved
- 10-FAL-335 - WAS feed pump #2 seal water fail ☐ Checked if approved
- 10-PAH-335 - WAS feed pump #2 discharge high pressure ☐ Checked if approved
- 10-YA-335 - WAS feed pump #2 VFD fail ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 10-AC-334 - Centrifuge WAS feed pump #1 speed reference ☐ Checked if approved
- 10-CS-334 - WAS feed pump #1 OIS start/stop switch ☐ Checked if approved
- 10-CS-334A - WAS feed pumps system OIS man/auto switch ☐ Checked if approved
- 10-CS-334B - WAS feed pumps system OIS duty/standby switch ☐ Checked if approved
- 10-SI-334 - Centrifuge WAS feed pump #1 speed feedback ☐ Checked if approved
- 10-YL-334A - WAS feed pump #1 remote ☐ Checked if approved
- 10-YL-334B - WAS feed pump #1 run ☐ Checked if approved
- 10-AC-335 - Centrifuge WAS feed pump #2 speed reference ☐ Checked if approved
- 10-SI-335 - Centrifuge WAS feed pump #2 speed feedback ☐ Checked if approved
- 10-YL-335A - WAS feed pump #2 remote ☐ Checked if approved
- 10-YL-335B - WAS feed pump #2 run ☐ Checked if approved
- 10-CS-336 - WAS OIS speed/flow mode switch ☐ Checked if approved
- 10-FIC-336 - WAS flow PID loop controller ☐ Checked if approved
- 10-HIK-336A - WAS flow speed setpoint ☐ Checked if approved
- 10-HIK-336B - WAS flow setpoint ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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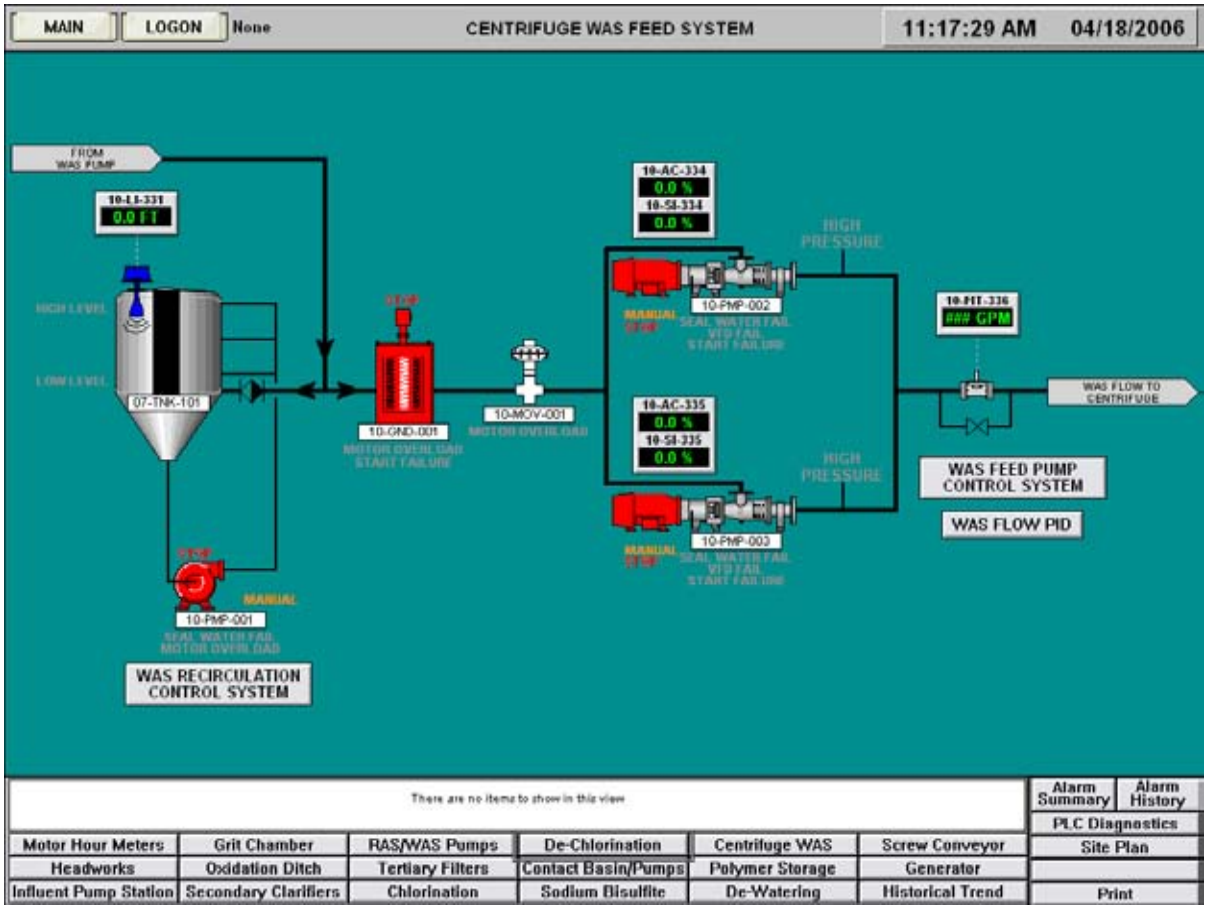
4.13 SOLIDS – DEWATERING POLYMER FEED



SOLIDS – DEWATERING POLYMER FEED

DRAWING NO.: N19

PROCESS DESCRIPTION: The polymer system consists of three polymer storage tote bins with mixing pumps and three automatic polymer blending units with polymer transfer pumps and mixers. The polymer batch system shall automatically control the dilution and batching of bulk polymer for feed to the centrifuges. The system shall also be capable of being operated in manual mode. The polymer blender units shall be packaged units.

LOCAL CONTROL: Each polymer blending unit local control panel shall have a LOCAL/OFF/REMOTE selector switch.

The blender shall operate as specified in Section 11246. The polymer feed rate and dilution water feed rate shall be controlled locally from the blender unit.

In local mode, the LCP shall start the blending system and control the sequence of the transfer pump, the mixer and the water solenoid valves. Speed control of the transfer pump shall be through a speed indicating controller (SIC) at the LCP, with setpoint entered manually.

INTERLOCK: Plant water feed line FLOW and PRESSURE LOW alarm shall shut down all polymer blending units. FLOW LOW ALARM shall annunciate at the LCP and OIS.

MCC FUNCTIONS: None

PLC FUNCTIONS: In the REMOTE mode of operation of the Polymer blending unit, 11-PBU-003, normally runs as needed to supply polymer for the filter bypass channel. Polymer blending units, 11-PBV-001 and 11-PBV-002 shall be sequenced as DUTY/STANDBY. The duty pump shall pace the WAS flow rate.

In the REMOTE/AUTO mode of operation the duty pump shall start upon receiving the dewatering start sequence LOAD signal from the centrifuge control panel. The active pump shall STOP when both centrifuges stop.

EQUIPMENT NO.: 11-LCP-001, 11-LCP-002, 11-LCP-003, 11-TNK-001, 11-TNK-002, 11-TNK-003, 11-PMP-001, 11-PMP-002, 11-PMP-003, 11-PBU-001, 11-PBU-002, 11-PBU-003, 11-FSH-361, 11-PSL-362, 11-FIT-363, 11-FIT-365

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID 19** and listed in part **3.34** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local control panels and the **OIS**. Calibrated flow transmitters can be verified by using a 4-20 mA signal generator at the PLC input to simulate various flow rates. Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 11-FAH-361 - Polymer storage area eyewash on ☐ Checked if approved
- 11-PAL-362 - Polymer carriage plant water pressure low ☐ Checked if approved
- 11-FAL-367 - Polymer blending unit #1 plant water loss ☐ Checked if approved
- 11-YA-367 - Polymer blending unit #1 fail ☐ Checked if approved
- 11-FAL-368 - Polymer blending unit #2 plant water loss ☐ Checked if approved
- 11-YA-368 - Polymer blending unit #2 fail ☐ Checked if approved
- 11-FAL-369 - Polymer blending unit #3 plant water loss ☐ Checked if approved
- 11-YA-369 - Polymer blending unit #3 fail ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 11-FI-363 - Polymer carriage plant water flow transmitter (0-10 GPM) ☐ Checked if approved
- 11-FSL-363 - Polymer plant water low flow switch ☐ Checked if approved
- 11-FFIC-364 - Polymer flow proportional controller ☐ Checked if approved
- 11-HIK-364 - Polymer hand indication control station ☐ Checked if approved
- 11-FI-365 - Polymer feed flow transmitter (0-25GPM) ☐ Checked if approved
- 11-CS-366A - PBU #1 & #2 OIS man/auto switch ☐ Checked if approved
- 11-CS-366B - PBU #1 & #2 OIS duty/standby switch ☐ Checked if approved
- 11-AC-367 - Polymer blending unit #1speed reference ☐ Checked if approved
- 11-CS-367 - PBU #1 OIS start/stop switch ☐ Checked if approved

- 11-HIK-367 - PBU #1 OIS hand indicating control station ☐ Checked if approved
- 11-YL-367A - Polymer blending unit #1 remote ☐ Checked if approved
- 11-YL-367B - Polymer blending unit #1 run ☐ Checked if approved
- 11-AC-368 - Polymer blending unit #2 speed reference ☐ Checked if approved
- 11-CS-368 - PBU #2 OIS start/stop switch ☐ Checked if approved
- 11-HIK-368 - PBU #1 OIS hand indicating control station ☐ Checked if approved
- 11-YL-368A - Polymer blending unit #2 remote ☐ Checked if approved
- 11-YL-368B - Polymer blending unit #2 run ☐ Checked if approved
- 11-AC-369 - Polymer blending unit #3 speed reference ☐ Checked if approved
- 11-CS-369 - PBU #3 OIS start/stop switch ☐ Checked if approved
- 11-HIK-369 - PBU #3 OIS hand indicating control station ☐ Checked if approved
- 11-YL-369A - Polymer blending unit #3 remote ☐ Checked if approved
- 11-YL-369B - Polymer blending unit #3 run ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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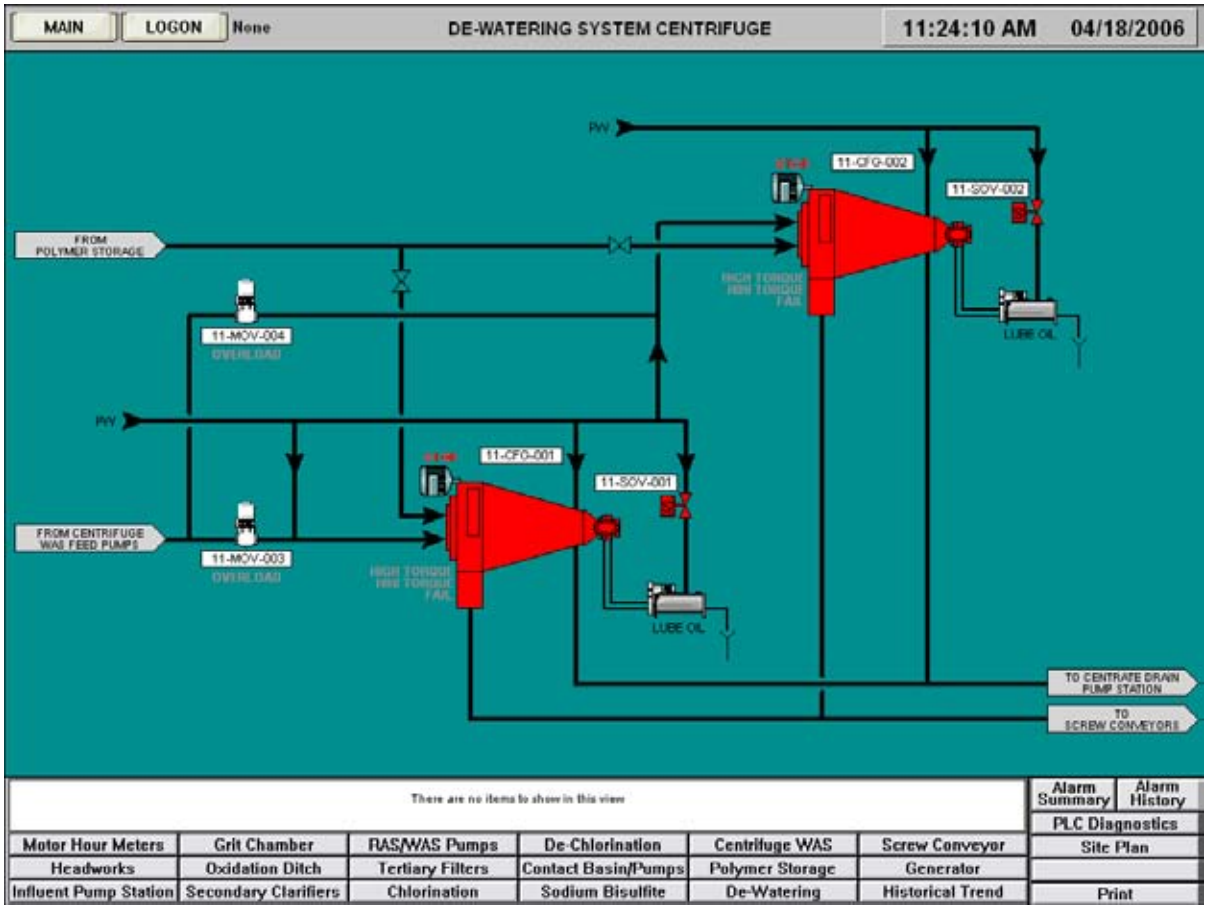
4.14 SOLIDS – CENTRIFUGES



SOLIDS – CENTRIFUGES

EQUIPMENT NO.: 11-LCP-001, 11-CFG-001, 11-MOV-001, 11-SOV-001, 11-MOV-003, 11-LCP-002, 11-CFG-002, 11-MOV-004, 11-MOV-002, 11-SOV-002

DRAWING NO.: N12

PROCESS DESCRIPTION: The Waste Activated Sludge Centrifuges produce low solid centrate stream and high solid cake. The Waste Activated Sludge is fed from the WAS feed system into the Centrifuge. Polymer solution is mixed, blended, and fed into the Centrifuge to aid the sludge dewatering process. Centrate shall be drained and the solid cake disposed via the screw conveyer system. Refer to specification sections, 3.33, 3.34, 3.35, and 3.38 for WAS feed, Polymer feed, and solid discharge system for required automatic sequence interlock.

LOCAL CONTROL: Plant Water Feed Valves. 11-MOV-Q01.11-MOV-002

The Plant Water Feed Valves feed plant water for centrifuges cleaning during centrifuge shutdown sequence and for the centrifuge Clear-in-Place (CIP) process.

Provide Local/Off/Remote selector switch at the valve actuator. On "Local" mode of operation, the Plant Water Feed Valve shall be operated at the valve actuator. On "Remote" mode of operation, the Plant Water Feed Valve shall be controlled from the Centrifuge

controller

Waste Activate Sludge Feed Valves. 11-MOV-003.11-MOV-004

The WAS Feed Valves feed waste activated sludge to the centrifuge. On "Local" mode of operation, the WAS Feed Valves shall be operated at the valve actuator. On "Remote" mode of operation, the WAS Feed Valve shall be controlled from the Plant PLC.

Centrifuge. 11-CFG-001. 11-CFG-002

The centrifuge and its associated drives shall be controlled from a common control panel. The Centrifuge control system shall consist of a microprocessor based control system and an Operator Interface.

The Centrifuge Controller shall communicate with the plant PLC using a mutual data communication protocol. Dewatering System equipment status signal for status display and control signals between the WAS feed system, polymer feed system, centrifuge, and the screw conveyer system; shall be transmit via the data communication link.

Generally, the dewatering system automatic start and stop sequence shall be initiated at the Centrifuge control panel. The centrifuge shall also be able to manually start and stop at the control panel. The centrifuges shall not be operated simultaneously. Refer to Specification 11358 for detail description on Centrifuge control panel requirement and operation description.

Provide the following additional dewatering system status and process indication at the Centrifuge control panels:

WAS Flowrate, 10-FI-336;

Polymer Flow rate, 11 -FI-365;

WAS Holding Tank Level, 1 0-LI-331;

WAS Holding Tank Level Low Alarm, 10-LAL-331;

Plant Water Feed Valves "Remote" status and position indication, 11-YL-386, 11-ZLO-386, 11-ZLC-386, 11-YL-390, 11-ZLO-390, 11-ZLC-390.

MCC FUNCTIONS: None

PLC FUNCTIONS: The Plant PLC shall be responsible for the automatic sequence control of the sludge dewatering systems including the WAS Feed Valve (10-MOV-001), Grinder (1 0-GND-001), WAS Feed pumps (1 0-PMP-002, 10-PMP-003), Polymer Blending Units (11-PBU-001, 11-PBU-002), Centrifuge WAS Feed Valves (1 1-MOV-003, 1 1-MOV-004), and the Screw Conveyers (11-CNV-001, 11-CNV-002, 11-CNV-003).

The Plant PLC shall provide a permissive signal "Dewatering System Auto Sequence Ready" to the Centrifuge control system for the Auto-Start/Stop sequence of the sludge dewatering system. The "Dewatering System Auto Sequence Ready" signal indicate that the centrifuge is in "Auto" mode of operation, all of the equipment listed above are in "Remote" mode of

operation, the WAS feed valves are "Closed", WAS feed pumps are not running, and the polymer blending units are not in operation. The Plant PLC shall send a Screw Conveyer system "RUN" signal to the centrifuge control system to confirm that the centrifuge is ready to load.

The Plant PLC shall start the screw conveyer system upon receiving a "Auto-Sequence Start" signal from the centrifuge control system. After respond to the centrifuge controller with a "Conveyers are Running" signal, the Plant PLC shall receive a "RUN" command from the centrifuge controller. The Plant PLC shall open the WAS feed valve and the centrifuge feed valve; start the grinder, WAS feed pumps, and the polymer mixing unit.

The Plant PLC shall stop the screw conveyer system, cease WAS and Polymer feeding when the centrifuge is either stopped by pressing the "Auto-Stop" on the centrifuge control panel or via fault condition. The WAS and Polymer feed system shall stop first thereby insuring that feed to the centrifuge is stopped. The conveyer system shall then be shutdown after a programmable time delay. Screw Conveyer "Failure" shall shutdown the Centrifuge. Refer to Section 11358 for a complete list of centrifuge shutdown condition.

Provide the following Centrifuge status at the Plant Operator Interface:

Centrifuge Fail, Centrifuge Run, Centrifuge in Auto Mode, Torque High, and Torque High High Alarm.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID 20** and listed in part **3.35** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local control panels and the **OIS**. Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 11-YA-381 - WAS feed isolation valve #1 overload ☐ Checked if approved
- 11-YA-382 - WAS feed isolation valve #2 overload ☐ Checked if approved
- 11-WAH-383 - Centrifuge #1 Hi torque alarm ☐ Checked if approved
- 11-WAHH-383 - Centrifuge #1 HiHi torque alarm ☐ Checked if approved
- 11-YA-383 - Centrifuge #1 fail ☐ Checked if approved
- 11-WAH-387 - Centrifuge #2 Hi torque alarm ☐ Checked if approved
- 11-WAHH-387 - Centrifuge #1 HiHi torque alarm ☐ Checked if approved
- 11-YA-387 - Centrifuge #2 fail ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 11-YL-381 - WAS feed isolation valve #1 remote ☐ Checked if approved
- 11-ZLC-381 - WAS feed isolation valve #1 is closed ☐ Checked if approved
- 11-ZLO-381 - WAS feed isolation valve #1 is open ☐ Checked if approved
- 11-YL-382 - WAS feed isolation valve #2 remote ☐ Checked if approved
- 11-ZLC-382 - WAS feed isolation valve #2 is closed ☐ Checked if approved
- 11-ZLO-382 - WAS feed isolation valve #2 is open ☐ Checked if approved
- 11-CS-383A - Centrifuge #1 OIS start/stop indication ☐ Checked if approved
- 11-CS-383B - Centrifuge #1 OIS load indication ☐ Checked if approved
- 11-YL-383A - Centrifuge #1 auto indication ☐ Checked if approved
- 11-YL-383B - Centrifuge #1 run indication ☐ Checked if approved

- 11-CS-387A - Centrifuge #2 OIS start/stop indication ☐ Checked if approved
- 11-CS-387B - Centrifuge #2 OIS load indication ☐ Checked if approved
- 11-YL-387A - Centrifuge #2 auto indication ☐ Checked if approved
- 11-YL-387B - Centrifuge #2 run indication ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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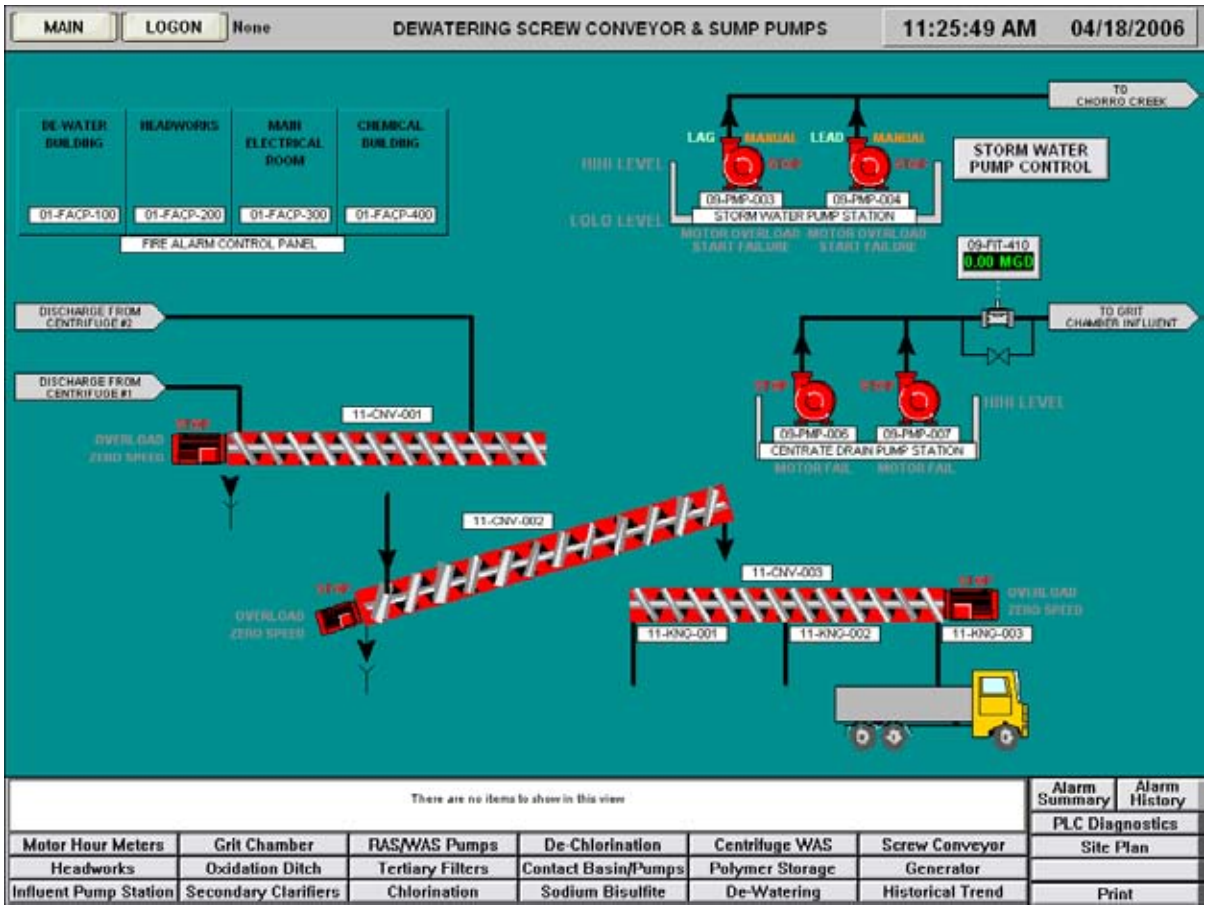
4.15 SOLIDS – CENTRIFUGE CAKE COLLECTION CONVEYORS AND DISCHARGE CONVEYORS



SOLIDS – CENTRIFUGE CAKE COLLECTION CONVEYORS AND DISCHARGE CONVEYORS

EQUIPMENT NO.: 11-LCP-006, 11-CNV-001, 11-CNV-002, 11-CNV-003, 11-KFG-001, 11-KFG-002, 11-KFG-003

DRAWING NO.: N21
PROCESS DESCRIPTION: Dewatered sludge is discharged onto the Centrifuge Discharge Conveyer and then transfers to the Incline Conveyer before the sludge is disposed into the disposal bin through the Loadout Conveyer.
LOCAL CONTROL: Centrifuge Discharge Conveyer. 11-CNV-001
Provide Local/Off/Remote selector, Start/Lockout Stop Pushbutton, and conveyer "RUN" indicator by the Centrifuge Discharge Conveyer. Two Safety Shutoff switches with pull cord shall shutdown the conveyer in case of emergency. On "Remote" mode of operation, the Discharge Conveyer shall be controlled from the Plant PLC.
Incline Conveyer. 11-CNV-002

Similar to Centrifuge Discharge Conveyer, 11-CNV-001

Loadout Conveyer and Gates. 11 -CNV-003.11-KFG-001.11-KFG-002. 11-KFG-003

Provide Local/Off/Remote selector, Forward/Stop/Reverse Pushbutton, Forward Running indicator, and Reverse Running indicator at the Loadout Conveyer. Two Safety Shutoff switches with pull cord shall shutdown the conveyer in case of emergency. On "Remote" mode of operation, the Loadout Conveyer shall be controlled from the Plant PLC.

The Loadout Conveyer gates shall be operated either from the control station located by the conveyer or from the Local Control Panel, 11-LCP-006. At the control station, provide Local/Off/Remote selector and Open/Stop/Close pushbutton for gate operation. On "Remote" mode of operation, the gates shall be operated from the Local Control Panel, 11-LCP-006. Provide a common "Close" pushbutton to close all gates. Individual "Open" Pushbuttons shall be provided to open the gates and they shall be properly interlocked such that only one gate can be open at a time. Also, provide "Gate Selected" contact for controls of the "Forward" or "Reverse" direction of the Loadout conveyer at the Plant PLC.

Provide the following indication at the control panel, 11-LCP-006:

Gates in "Remote" indication;

Gates "Open" and "Closed" indication;

Dewatering System in "Auto";

Centrifuges "Running".

INTERLOCK: Motion Detector shall be provided for all screw conveyers for shutdown interlock.

MCC FUNCTIONS: Shutdown conveyer when shutoff switch is activated. Motor "Overload", and conveyer "Stalled" shall shutdown the conveyer also. Stalled conveyer shall be "Reset" before restart. Provide Indication for conveyer "Running", "Overload", and "Stalled".

PLC FUNCTIONS: The controls of the screw conveyers under the "Remote" mode of operation shall be resided in the Plant PLC for automatic sequence control. Upon received an "Auto-Start" command from either one of the centrifuge, the Loadout conveyer, 11CNV-003, shall start. The Inclined conveyer, 11-CNV-002, and Centrifuge Discharge Conveyer, 11-CNV-001, shall then start after the confirmed "RUN" of the Loadout conveyer. A "CONVEYERS ARE RUNNING" signal shall be provided for the Centrifuges controls to confirm that the conveyers are running. Upon received an "Auto-Stop" signal from the centrifuge controls, the conveyer system shall continue to run for an adjustable period before coming to a complete stop.
Centrifuge Discharge Conveyer. 11-CNV-001:

Provide "Remote", "Run", "Overload", and "Stall" indication and alarm at the OIS. Provide "Start/Stop" signal for the MCC.

Inclined Conveyer. 11-CNV-OQ2:

Similar to 11-CNV-001.

Loadout Conveyer. 11-CNV-003:

Provide "Remote", "Forward Run", "Reverse Run", Overload, and "Stalled" indications and alarms at the OIS. Provide "Forward Start/Stop" and "Reverse Start/Stop" signal for the MCC.

Indicate gates "Open" and "Closed" at the OIS.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID 21** and listed in part **3.36** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local control panels, MCC's and the **OIS.** Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 11-SAL-391 - Centrifuge discharge conveyor stalled ☐ Checked if approved
- 11-YA-391 - Centrifuge discharge conveyor overload ☐ Checked if approved
- 11-SAL-392 - Incline conveyor stalled ☐ Checked if approved
- 11-YA-392 - Incline conveyor overload ☐ Checked if approved
- 11-SAL-395 - load out conveyor stalled ☐ Checked if approved
- 11-YA-395 - load out conveyor overload ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED;

- 11-YL-391A - Centrifuge discharge conveyor remote ☐ Checked if approved
- 11-YL-391B - Centrifuge discharge conveyor run ☐ Checked if approved
- 11-YL-392A - Incline conveyor remote ☐ Checked if approved
- 11-YL-392B - Incline conveyor run ☐ Checked if approved
- 11-YL-395A - load out conveyor remote ☐ Checked if approved
- 11-YL-395B - load out conveyor run reverse ☐ Checked if approved
- 11-YL-395C - load out conveyor run forward ☐ Checked if approved
- 11-YL-396 - load out conveyor gate 1 selected ☐ Checked if approved
- 11-ZSC-396 - load out conveyor gate 1 is closed ☐ Checked if approved
- 11-ZSO-396 - load out conveyor gate 1 is open ☐ Checked if approved
- 11-YL-397 - load out conveyor gate 2 selected ☐ Checked if approved
- 11-ZSC-397 - load out conveyor gate 2 is closed ☐ Checked if approved
- 11-ZSO-397 - load out conveyor gate 2 is open ☐ Checked if approved
- 11-YL-398 - load out conveyor gate 3 selected ☐ Checked if approved
- 11-ZSC-398 - load out conveyor gate 3 is closed ☐ Checked if approved
- 11-ZSO-398 - load out conveyor gate 3 is open ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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CENTRATE DRAIN PUMP STATION

EQUIPMENT NO.: 09-LCP-001, 09-PMP-006, 09-PMP-007, 09-LSHH-411, 09-LSH-411, 09-LSM-411, 09-LSL-411,09-FIT-410

DRAWING NO.: N22

PROCESS DESCRIPTION: Two submersible pumps designed for storm drainage, plant drainage and wastewater services shall pump drainage and wastewater to the influent channel of the Grit Chamber. Pumps shall START/STOP based on level float switches in the sump. Pumps shall alternate the lead and lag positions.

LOCAL CONTROL: Provide Local Control Panel from pump manufacturer as specified in Section 11312K.

MCC FUNCTIONS: Indicate centrate flow, 09-FI-410 at the OIS. For Centrate Drain Pumps No. 1 and 2 (09-PMP-006, 09-PMP-007) provide RUN and AUTO Indication at the OIS. Annunciate motor FAIL at the OIS.

Provide LOAD SHED operation.

PLC FUNCTIONS:
FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID 22** and listed in part **3.37** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local control panels and the **OIS**. Calibrated flow transmitters can be verified by using a 4-20 mA signal generator at the PLC input to simulate various flow rates. Float-type level switches can be verified by rotating the switch to the floating position. Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 09-LAHH-411Centrate drain sump HIHI level ☐ Checked if approved
- 09-YA-413 - Centrate drain pump #1 fail ☐ Checked if approved
- 09-YA-414 - Centrate drain pump #2 fail ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 09-FI-410 - Centrate drain flow transmitter ☐ Checked if approved
- 09-YL-413A - Centrate drain pump #1 auto ☐ Checked if approved
- 09-YL-413B - Centrate drain pump #1 run ☐ Checked if approved

- 09-YL-414A - Centrate drain pump #2 auto ☐ Checked if approved
- 09-YL-414B - Centrate drain pump #2 run ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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STORM WATER PUMPS

EQUIPMENT NO.: 09-PMP-003, 09-PMP-004, 09-LSHH-415, 09-LSH-415, 09-LSM-415, 09-LSL-415, 09-LSLL-415

DRAWING NO.: N22

PROCESS DESCRIPTION: The storm water pumps are existing. New level switch floats shall be installed in the existing storm water pump station. Storm water. Pumps are only used when the creek on the north side of the flood waif rises above the flap gate of the existing gravity 18-inch outfall. Storm water pumps pump storm drainage water through an existing force main to the creek.

LOCAL CONTROL: The storm water pumps shall have LOCAL/OFF remote selector switches and START/LOCKOUT/STOP pushbuttons for local pump operation.

INTERLOCK: Float switch LSLL shall shutdown both pumps; float switch LSHH shall start both pumps regardless.

MCC FUNCTIONS: Provide RUN indication at MCC.

PLC FUNCTIONS: The storm water pumps shall run on a LEAD/LAG control sequence, in the REMOTE mode op operation, provide AUTOMATIC and MANUAL mode of operation. Pump shall start or stop manually from the OIS in the REMOTE/MANUAL mode of operation. Under REMOTE/AUTOMATIC mode of operation, LEAD pump shall start at level LSM and stop a LSL. LAG pump shall start when LSH activated. Both pumps shall stop when the sump is pumped down to LSL sump level.

Provide REMOTE and RUN status at the OIS. Annunciate MOTOR OVERLOAD, sump level low low LALL, and sump level' high high LAHH at the OIS.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID 22** and listed in part **3.38** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on MCC's and the **OIS**. Float-type level switches can be verified by rotating the switch to the floating position. Verify that required alarms and status indicators are transmitted to **PLC-1** and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 09-LALL-415 - Storm water pump station LOLO level ☐ Checked if approved
- 09-LAHH-415 - Storm water pump station HIHI level ☐ Checked if approved
- 09-YA-417 - Storm water pump #1 overload ☐ Checked if approved
- 09-YA-418 - Storm water pump #2 overload ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 09-CS-415A - Storm water pumps OIS lead/lag switch ☐ Checked if approved
- 09-CS-415B - Storm water pumps OIS man/auto switch ☐ Checked if approved
- 09-CS-417 - Storm water pump #1 OIS start/stop switch ☐ Checked if approved
- 09-YL-417A - Storm water pump #1 remote ☐ Checked if approved
- 09-YL-417B - Storm water pump #1 overload ☐ Checked if approved
- 09-CS-418 - Storm water pump #2 OIS start/stop switch ☐ Checked if approved
- 09-YL-418A - Storm water pump #2 overload ☐ Checked if approved
- 09-YL-418B - Storm water pump #2 overload ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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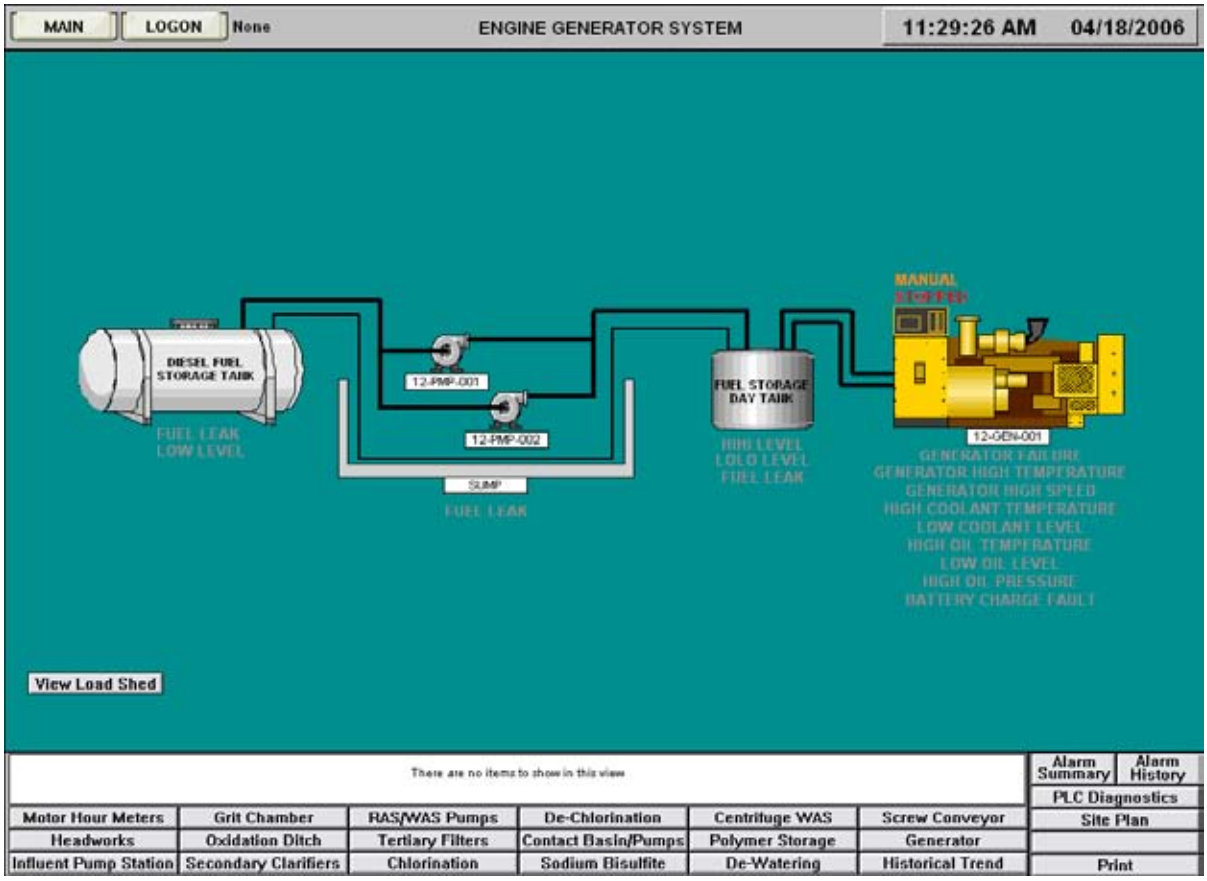
4.16 ENGINE GENERATOR SYSTEM



ENGINE GENERATOR SYSTEM

EQUIPMENT NO.: 12-LCP-001, 12-GEN-001, 12-EE-442, 12-PMP-001, 12-PMP-002, 12-TNK-001, 12-TNK-002

DRAWING NO.: N23

PROCESS DESCRIPTION: Fuel transfer pumps control/monitoring and leak/level alarms for
the fuel oil tanks and sump shall be as shown on DWG N23.

The standby generator shall be supplied with a local control panel, which shall contain a manual/auto selector switch. Other panel-mounted devices shall be as described in Section 16233.

Manual/auto switch in manual position: In manual starting/stopping of generator and loading of generator shall be as described in Section 16233.
Manual/auto switch in auto position: In auto, the generator shall be automatically started and stopped by the transfer switch in the event loss of power on the main utility. The generator internal controls shall automatically maintain voltage and frequency of the main buss while it is in operation. The PLC shall receive a signal from the automatic transfer switch to initiate a load shedding program. The PLC shall verify that the generator system is

in auto mode and that the utility voltage is below 90 percent of nominal before executing the load shedding program.

Load shedding program: The PLC shall perform the load shedding function by controlling a normally-closed digital output (D.O.) for each equipment in accordance with the "load shed and start priority" table. For equipment assigned with start priority 0, no load shedding is required. From priority 1 on, load shedding shall be done simultaneously.

Restart enable operation after generator is started: After load shedding is executed and after verification that the generator has been started and running, the PLC shall enable the equipment assigned with start priority 1 to 4 to be restarted in steps 15 seconds (adjustable timer in the PLC program to be provided). Those equipment with priority 1 shall be enabled first one by one and then start priority 2 equipment shall come in turn and so on.

Restart enable after utility power comes back: After execution of the load shedding program and verification that the utility power supply is back (95 percent and above of utility voltage is sensed by the utility monitor and D.I. signal sent to PLC), the PLC after a time delay (0-5 seconds) shall enable the restart of equipment assigned with start priority 1 to 4 in steps of 15 seconds (adjustable in the PLC program). (NOTE: after the utility power comes back, the generator shall be shut off through the generator control panel, resulting in the necessity of shutting down the equipment with start priorities 1 to 4 again, through the prior PLC.

"Restart Enable" shall not start any equipment. It shall only allow the equipment to be started by the operator when they are in the "LOCAL" or "MANUAL" modes and started by automatic sequence when they are in the "AUTO" or "REMOTE" modes.

LOCAL CONTROL: None

MCC FUNCTIONS: None

PLC FUNCTIONS: The following information shall be displayed at the PLC/OIS.

(1) Generator control panel manual/auto selector switch In auto position.

(2) Generator, run and run time meter.

(3) Generator fail.

(4) Utility voltage > 95 percent.

(5) Utility voltage > 90 percent alarm.

(6) All setpoint time delays.

(7) All equipment in load shedding program.

(8) Load shed, and start priority table included directly following.

FUNCTIONS TO BE TESTED: All functions of equipment listed above as shown on **P&ID 23** and listed in part **3.39** of the Process Control Description.

TESTING PROCEDURE: Run all equipment listed above and verify each control and indication provided on local control panels, MCC's and the **OIS**. Verify that required alarms and status indicators are transmitted to **PLC-**1 and are displayed on the **OIS**.

PLC-1 / OIS ALARMS TO BE VERIFIED:

- 12-XAH-431 - Generator fuel tank leak ☐ Checked if approved
- 12-LAL-432 - Generator fuel tank low level ☐ Checked if approved
- 12-XAH-433 - Generator fuel piping leak ☐ Checked if approved
- 12-XAH-434 - Generator day tank leak ☐ Checked if approved
- 12-LALL-435 - Generator day tank HIHI level ☐ Checked if approved
- 12-LAHH-435 - Generator day tank LOLO level ☐ Checked if approved
- 12-LAL-439 - Generator cooling water low level ☐ Checked if approved
- 12-TAH-439 - Generator cooling water - high temp ☐ Checked if approved
- 12-LAL-440 - Generator lube oil low level ☐ Checked if approved
- 12-PAH-440 - Generator lube oil high pressure ☐ Checked if approved
- 12-TAH-440 - Generator lube oil high temp ☐ Checked if approved
- 12-UA-441 - Generator battery charge fault ☐ Checked if approved
- 12-YA-442 - Power system low voltage ☐ Checked if approved
- 12-SAH-444 - Generator high speed ☐ Checked if approved
- 12-TAH-444 - Generator high temp ☐ Checked if approved
- 12-YA-444 - Generator fail ☐ Checked if approved

PLC-1 / OIS STATUS INDICATORS / PLC FUNCTIONS TO BE VERIFIED:

- 12-YL-442 - Power system normal voltage ☐ Checked if approved
- 12-YL-443 - Power system load shed initiate ☐ Checked if approved
- 12-YL-444A - Generator auto ☐ Checked if approved
- 12-YL-444B - Generator run ☐ Checked if approved

CONTROL STRATEGY TO BE VERIFIED:

- Indication Properly Configured ☐ Checked if approved
- Manual Operation ☐ Checked if approved
- Auto Operation ☐ Checked if approved
- Run Time and Flow Accumulation ☐ Checked if approved

TRENDING AND HISTORISATION TO BE VERIFIED:

- Trending ☐ Checked if approved
- History Functionality ☐ Checked if approved

AUTO DIALER ALARM TO BE VERIFIED (IF APPLICABLE) ☐ Checked if approved

Approved By: _____ Date: _____

Comments _____

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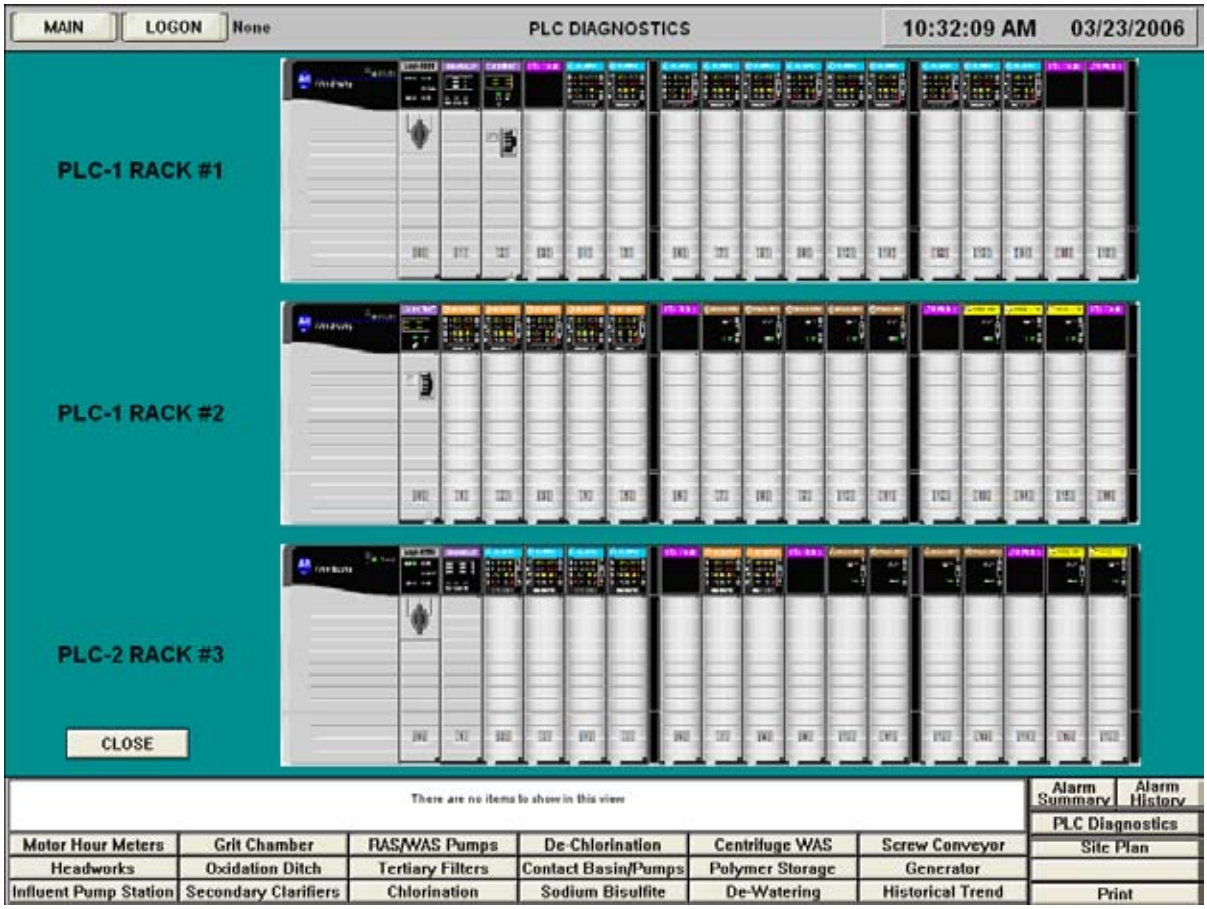
4.17 PLC DIAGNOSTICS



Approved By: _____ Date: _____

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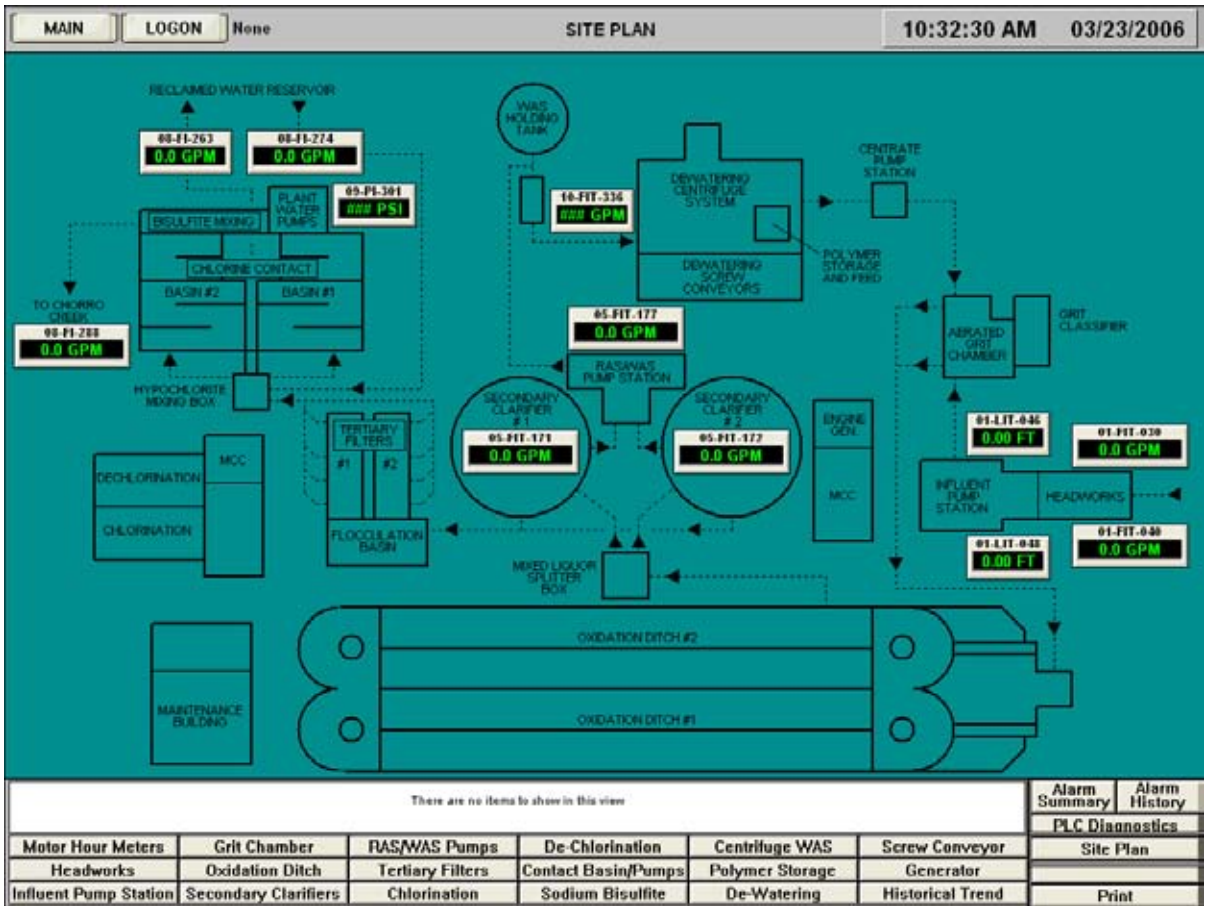
4.18 SITE PLAN



Approved By: _____ Date: _____

Comments _____

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STATE OF CALIFORNIA

DEPARTMENT OF GENERAL SERVICES

Project Management Branch, Real Estate Services Division

Department of Corrections & Rehabilitation

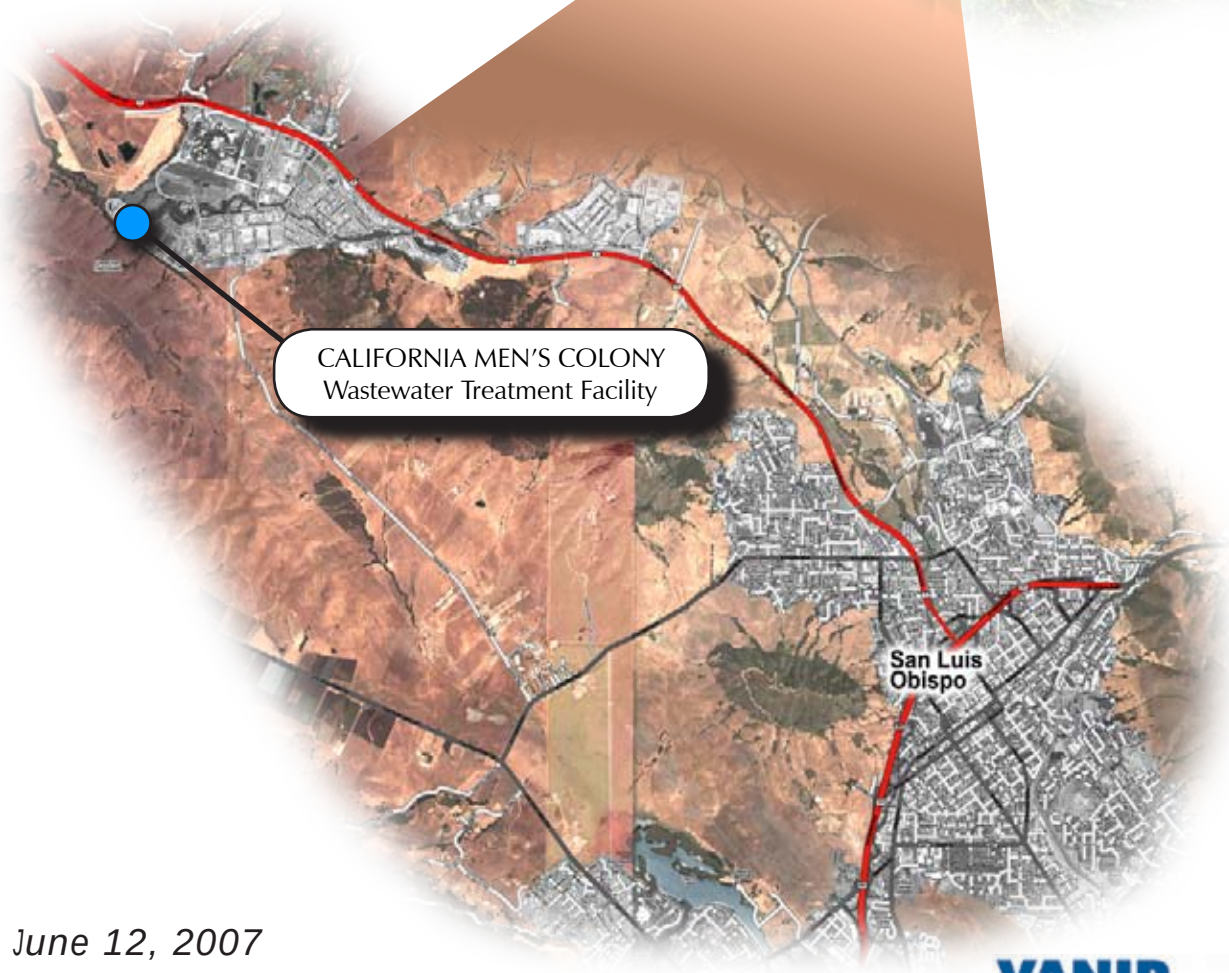
California Men's Colony

Wastewater Collection Treatment Upgrade

Startup Plan

BOOK 3

Completed Startup Checklists



June 12, 2007

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