INL/EXT-10-20704

Operation and Maintenance Manual for the Central Facilities Area Sewage Treatment Plant

February 2011

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FOREWORD

An initial Plan of Operation, identified as the Central Facilities Area (CFA) Sewage Treatment Plant (STP) Operation and Maintenance Manual (OPE-SP-94-421) was submitted to the Idaho Department of Environmental Quality in November 1994. After completion of STP construction, a final plan was published in April 1995 (OPE-SP-95-199). The Operation and Maintenance Manual was subsequently revised in December 1996 (INEL-96-0158) after 1 year of operation and was revised again in November 2001 and January 2006 to incorporate the requirements of permit modifications and to address changes to operating methodologies.

This revision to the January 2006 Plan of Operation updates references sources, wastewater characteristics monitoring practices, and requirements in the Municipal Wastewater Reuse Permit (LA-000141-03) issued March 17, 2010.

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ACRONYMS

ANSI	American National Standards Institute
ASQC	American Society for Quality Control
BOD	biological oxygen demand
CFA	Central Facilities Area
COD	chemical oxygen demand
DEQ	Department of Environmental Quality
DOE	Department of Energy
DOE-ID	Department of Energy Idaho Operations Office
ft/s	feet per second
gpd	gallons per day
gpm	gallons per minute
IDAPA	Idaho Administrative Procedure Act
INL	Idaho National Laboratory
LI	Laboratory Instruction
MG	million gallons
NNN	nitrate + nitrite as nitrogen
O&M	Operations and Maintenance
ppm	parts per million
psi	pounds per square inch
PVC	polyvinyl chloride
QA	quality assurance
QC	quality control
SAE	Society of Automotive Engineers
STP	sewage treatment plant
TDS	total dissolved solids
TSS	total suspended solids
WLAP	Wastewater Land Application Permit

Operation and Maintenance Manual for the Central Facilities Area Sewage Treatment Plant

1. INTRODUCTION

This Operation and Maintenance (O&M) Manual is the basic reference for the operation and maintenance of the equipment and processes that comprise the Central Facilities Area (CFA) Sewage Treatment Plant (STP) at the Idaho National Laboratory (INL) Site. The manual is required by the facility's Municipal Wastewater Reuse Permit (LA-000141-03). Managers, operators, and maintenance personnel use this manual and associated company and equipment manufacturer's procedures to operate the STP in support of CFA activities and permit requirements. The Laboratory Instructions (LI) listed below provide additional step-by-step instructions for operating specific components of the STP and laboratory equipment. LIs are prepared and cancelled as needed to provide directions for operating and maintaining STP equipment.

- LI-283, "Operate CFA Wastewater Pivot System"
- LI-284, "Wastewater Sampling and Analysis"
- LI-286, "Operate Sewage Treatment Plants at RTC and CFA"
- LI-287, "Model 837 Portable pH Meter Operating Instructions"
- LI-289, "Model 840 Portable Dissolved Oxygen Meter Operating Instructions"
- LI-8540, "Liquid Effluent Sampling."

The CFA STP has been designed to effectively treat raw wastewater by biologically digesting the majority of the organic waste and other major constituents, thereby producing a treated wastewater suitable for reuse via land application. This system depends on physical and biological processes to treat wastewater. Once applied to land using the pivot irrigation system, evapotranspiration is the principal mechanism for the final disposition of wastewater.

2. OPERATION AND MANAGEMENT RESPONSIBILITY

2.1 Operator Responsibilities

Operators at the CFA STP include a responsible charge operator, a substitute responsible charge operator and several system operators. The responsible and substitute responsible charge operators have or will obtain Class II or greater licenses as required by Idaho Administrative Procedures Act (IDAPA) 58.01.02.404. The responsible charge operator directly supervises operation of the CFA STP, including directing personnel employed at the same system. The responsible charge operator has an active daily onsite and on-call presence at the CFA STP. The substitute responsible charge operator replaces and performs the same duties when the responsible charge operator is not available. All operators' responsibilities include, but are not limited to, the following:

- Knowing all operational aspects outlined in this manual
- Being familiar with applicable permit, state, and federal requirements, monitoring, reporting and record forms that must be completed concerning STP operations
- Maintaining complete and accurate operation records
- Knowing the hazards connected with the treatment facility
- Knowing the capabilities and limitations of the complete wastewater treatment system and how to best operate the system with changing loading and climate conditions
- Notifying managers of potential problems of a serious nature.

2.2 System Operator Training Requirements

Hands-on STP operators must be INL-qualified utility operators familiar with the equipment and processes of the STP. System operators are onsite to perform continuous routine operations and respond to emergency or upset events 24 hr/day, 7 days/week. They must have the ability to operate STP equipment, collect, compile, and evaluate operating information, and to plan necessary actions and maintenance procedures to achieve continuous proper operation of the plant under the supervision of the Responsible/Substitute Responsible Charge Operators. The utility operators are able to use sound judgment regarding when and where to obtain additional help. STP system operators are required to have the following training:

- CFA Utility Operator
- Electrical Safety
- Radiation Worker I or General Employee Radiological Training
- Confined Space Entry
- Asbestos Awareness
- Lock Out/Tag Out
- Hantavirus
- Fall Protection.

2.3 Management Responsibility

Management support of the STP is an essential element of the properly conducted operation and maintenance program. Responsibilities of management include, but are not limited to, the following:

- Knowing how the system operates and the function and purpose of each major element of the system, including awareness of significant or frequently recurring issues associated with the system and specific elements
- Ensuring the operators are provided with current and appropriate technical manuals, and ensuring funds are available in the operation budget for training and licensing
- Understanding the elements of periodic reports required by state and federal agencies; ensuring that required operation and maintenance tasks are properly done, and ensuring the reports are accurate and submitted in a timely manner.

3. WASTEWATER REUSE PERMIT AND STANDARDS

3.1 Municipal Wastewater Reuse Permit

The CFA STP is operated in compliance with requirements of Municipal Wastewater Reuse Permit LA-000141-03 issued March 17, 2010. The permit specifies compliance activities, limits and conditions, and monitoring and reporting requirements for the STP. Operators must be familiar with the requirements and conditions of the permit and operate the STP accordingly. The existing permit is shown in Appendix A and will expire March 16, 2015.

3.2 Permit Compliance Activities and Status

Permit-specified compliance activities are summarized in Table 1.

Table 1. CFA STP permit compliance activities and status.

Compliance Activity Number	Compliance Activity Description Summary	Compliance Activity Status
CA-141-01	Final Plan of Operation (O&M Manual)	This document will complete this requirement following review and approval by the Department of Environmental Quality (DEQ). Due for submittal to the DEQ by March 17, 2011
CA-141-02	Submit Seepage Testing Procedure for DEQ approval	Due May 31, 2014
CA-141-03	Submit Seepage Testing Report	Due August 31, 2014

3.3 Permit Limits and Conditions

Permit limits and conditions are detailed in the Municipal Wastewater Reuse Permit (LA-000141-03) included in Appendix A.

3.4 Monitoring Requirements

Permit monitoring requirements are detailed in the Municipal Wastewater Reuse Permit (LA-000141-03) included in Appendix A Monitoring procedures and quality assurance (QA)/quality control (QC) protocols are discussed in Section 4.6.

4. GENERAL PLANT DESCRIPTION

4.1 Facility Description

The CFA STP processes wastewater derived from sanitary sewer drains throughout CFA. An area map showing the location of the STP at CFA is shown in Figure 1. The wastewater is derived from equipment and vehicle maintenance areas; boiler blow down, heating, ventilation, and air conditioning systems; employee showers and restrooms; laboratories; craft shops; a fire station; a cafeteria and a medical dispensary. Additional wastewater is transported from other INL septic tanks, portable toilets, and temporary office/laboratory trailers with holding tanks.

Major components of the CFA STP include a wastewater lift station, pressure main, lagoon system, and a pivot irrigation land application system. The lagoon system consists of a 1.7-acre treatment lagoon (Lagoon 1) with partial-mix aeration capabilities, a 10.3-acre facultative lagoon (Lagoon 2), and a 0.5-acre polishing lagoon (Lagoon 3). Land application of treated wastewater is by a 350-gpm pivot irrigation system used to dispose of water during 7 months of the year (April 1–October 31) on 73.5 acres of desert rangeland. During the other 5 months, the effluent is stored in the lagoons. An area map showing the location of the STP and CFA is show in Figure 1. Figure 2 is a schematic of the lagoon system and associated piping, and Figure 3 is a diagram of the hydraulic profile of the lagoon and piping system.

4.2 Principal Design Criteria

Sanitary wastewater is pumped from the lift station into the 1.7-acre lagoon for initial treatment. The first lagoon is equipped with mechanical mixer-aerators to oxygenate the wastewater and facilitate treatment. The aerators serve to keep a portion of the lagoon free from ice during the winter, reduce odor, and maximize turnover in the spring and fall. The water depth is maintained at 7–8 ft. Wastewater from the initial treatment lagoon flows by gravity over a weir gate in a transfer structure into a 10.3-acre facultative lagoon that typically consists of three zones of treatment: aerobic processes near the surface, facultative processes in the middle, and anaerobic processes on the bottom. From the facultative lagoon, wastewater flows to the 0.5-acre polishing lagoon for settling out any remaining suspended solids before discharge to the pivot irrigation system for land application. The water depth in the facultative and polishing lagoons varies seasonally. The depth increases during winter months and decreases during the summer due to increased evaporation and land application.

The STP was designed for a maximum flow rate of 250,000 gal/day with 85% removal efficiency for biochemical oxygen demand (BOD). One hundred twenty days of detention time was also required to store the wastewater from November 1 to March 31 each year. Using these criteria, the lagoons and application area were sized as shown in Table 2.

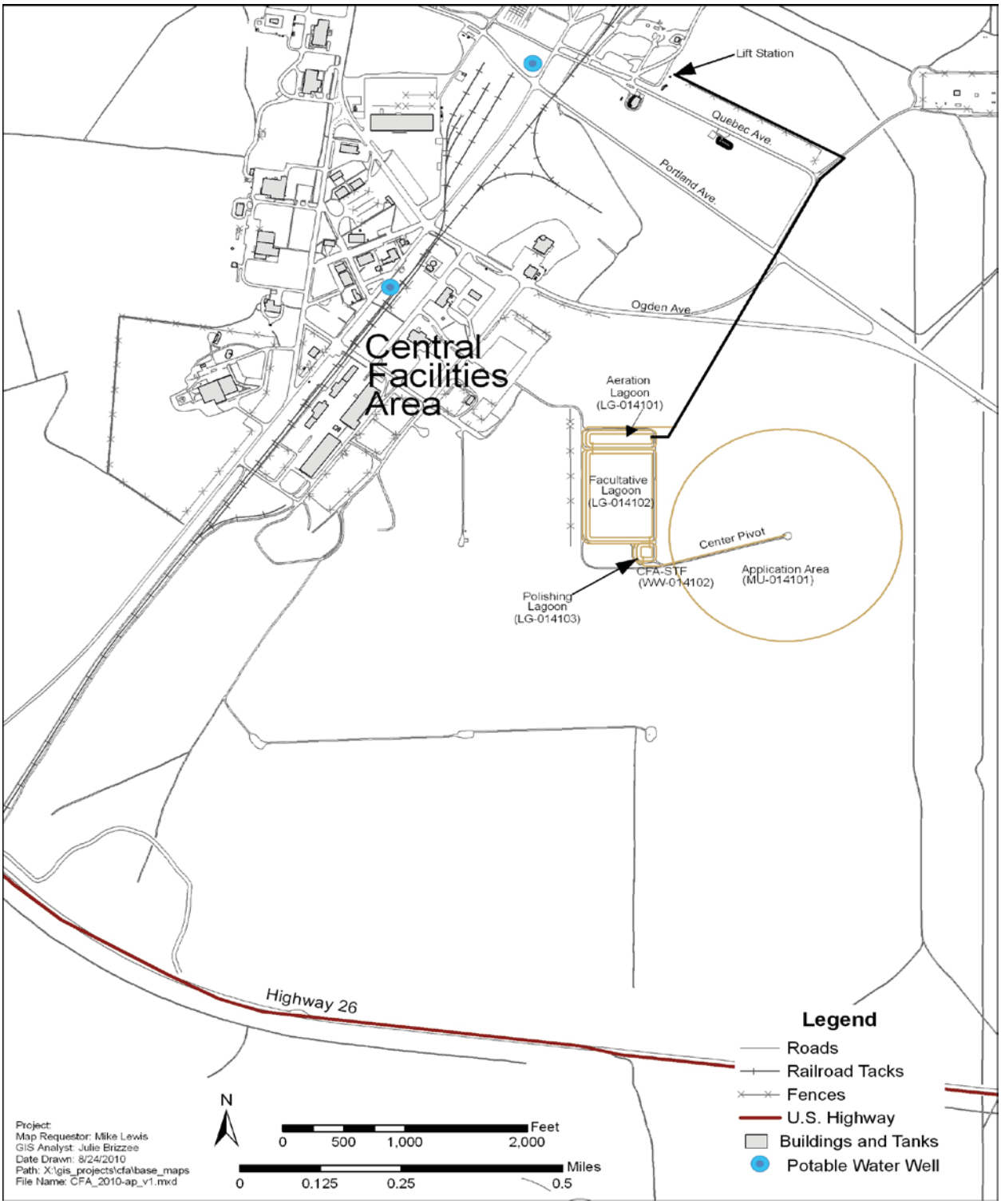

Figure 1. Area map showing the location of the STP at CFA.

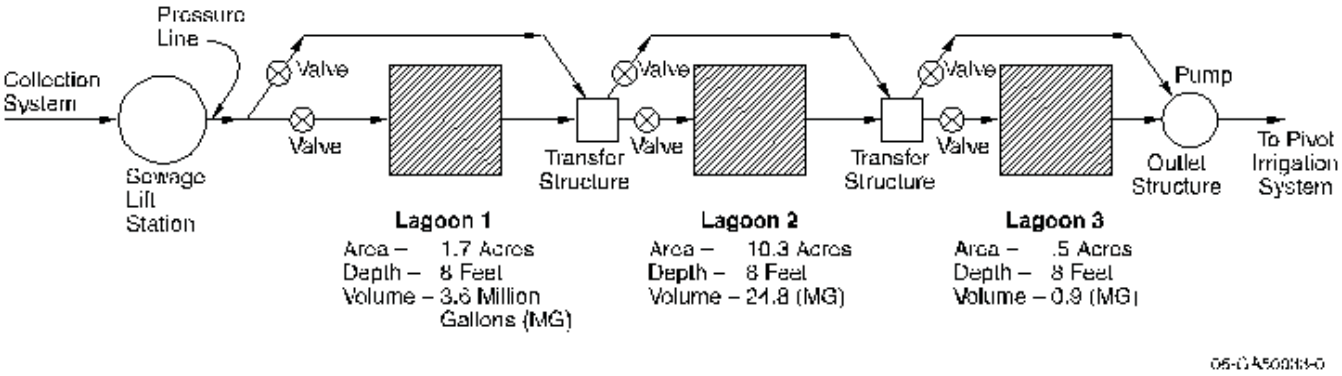

Figure 2. Treatment plant schematic of the Central Facilities Area Sewage Treatment Plant.

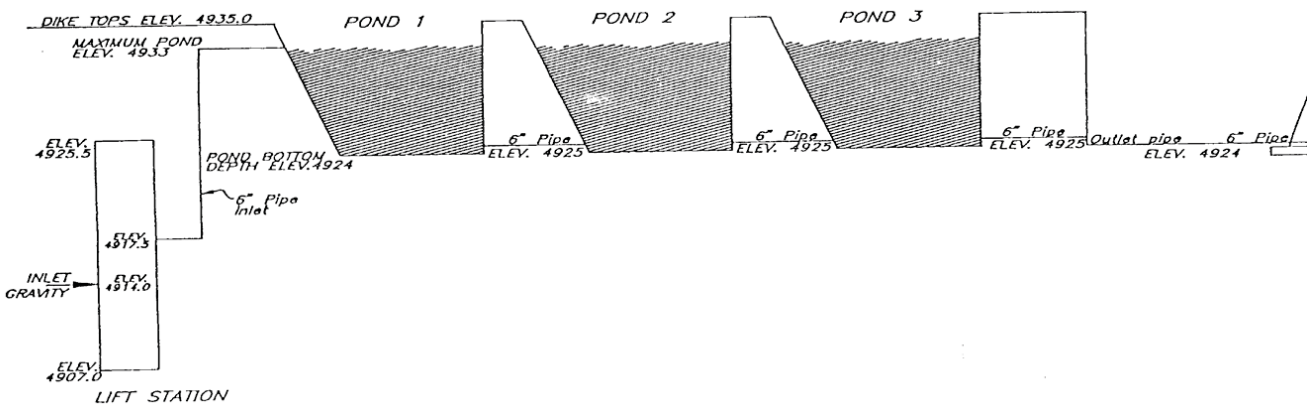

Figure 3. Hydraulic profile of the Central Facilities Area Sewage Treatment Plant.

Table 2. STP design criteria.[a]

Lagoon	Approximate Surface Dimensions (ft) at 8 ft Water Depth	Approximate Capacity (gal) at 8 ft Depth	Approximate Detention Time
1	556 × 134	3,600,000	16.6 days
2	556 × 808	24,800,000	103.7 days
3	148 × 148	900,000	4.3 days
Application Area	73.5 acres (circular area 1,010 ft. radius)		

a. Source – Engineering Design File, CFA STP Design, File Number 020017.A, October 1993.

4.3 Wastewater Characteristics

Wastewater generated at CFA is typically classified as "low strength" based on concentrations of BOD, chemical oxygen demand (COD), total nitrogen (TN), and total suspended solids (TSS). Annual average influent wastewater characteristics during 2000–2009, based on monthly sampling, are shown in Table 3.

Table 3. Average annual wastewater influent characteristics.

Sample Year	TKN[a] (mg/L)	NNN[b] (mg/L)	TN[c] (mg/L)	BOD[d] (mg/L)	COD[e] (mg/L)	TSS[f] (mg/L)	pH
2000	13.39	0.57		48.4	117.6	80.5	7.86
2001	15.67	0.621		45.1	107.3	39.5	7.77
2002	15.2	0.77		45	174	50	8.17
2003	12.53	0.613		47.12	96.7	71.05	7.84
2004	12.16	0.374		48.29	84.3	52.85	7.87
2005	23.04	0.76		66.84	118.1	82.96	7.84
2006	23.2	1.202		98.9	119.3	81.3	7.72
2007	20.1	1.42	21.52	165.6	154.4	80	7.43
2008	18.9	0.818	19.73	89.3	120.6	92.8	7.86
2009	18.5	0.962	19.49	62.5	113.3	95.2	7.83

a. Total Kjeldahl nitrogen
b. Nitrate + nitrate as nitrogen
c. Total nitrogen (calculated as the sum of TKN + NNN)
d. Biochemical oxygen demand
e. Chemical oxygen demand
f. Total suspended solids

4.4 Operation and Control of Unit Operations

4.4.1 Collection System

The STP collection system is not considered to be a component of the STP addressed in this manual and will only be briefly described. The collection system piping, manholes, lift stations, and pretreatments (oil/water separators) convey wastewater from generating locations to the CFA Lagoon 1 for initial treatment. The collection system contains two oil-water separators and two lift stations.

Oil-water separators are located in the drain system from the CFA-609 security building and the CFA-696 vehicle maintenance shop. The CFA-609 building was formerly used for helicopter maintenance and operations, but it is currently used for other research and development programs. The CFA-696 oil water separator receives wastewater from vehicle washing and maintenance shop floor drains. Both of the oil water separator sumps are checked periodically and cleaned as needed. Sludge from the sumps is sent offsite for disposal.

Lift stations are located near CFA-609 and CFA-1605 Wastewater Laboratory. The lift station (structure CFA-717) near CFA-609 serves to elevate drainage from the CFA-608 and 609 buildings to the gravity flow collection piping. The remainder of the CFA collection system gravity drains to the lift station located near CFA-1605 (structure CFA-1718). The lift stations are inspected and tested for proper operation daily per LI-286 and are pressure washed as needed.

The CFA-717 lift station has two 5 hp pumps that elevate wastewater to the gravity-flow piping. All of the wastewater that enters the collection system flows to the CFA-1718 lift station. It contains two 20-hp, 350 gal/min pumps installed inside a 10-ft-diameter wet well formed of precast concrete barrel sections placed at the end of the interceptor system. The electrical panels for both lift stations are located above ground. Control of the pumps is provided automatically through controllers driven by ultrasonic level indicators or float activated switches. The sensors monitor the elevation of the wastewater in the wet wells. High water/low water alarms are built into the controllers and backup level sensing switches are also provided in case both the pumps and the level indicator fail at either station.

A bypass pump for the CFA-1718 lift station is available so that sewage can be rerouted around the lift stations during emergency conditions. Additionally, a separate electrical power connection with a transfer switch allows a portable generator to provide standby power for the lift stations in the event of a power outage.

General maintenance of the wastewater lift stations involves cleaning chores, including maintaining a relatively clean and grease-free condition in the wet well. Particular care is given to avoid grease buildup on the control floats and solids buildup on the floor of the wet well. Occasional wash down with a fire hose or pressure washer is performed to keep the stations clean. If fire hydrants are used for wash down the activity is coordinated with and approved by the CFA fire protection engineer or safety engineer.

4.4.2 Valves

All valves in the system are designed for a maximum water working pressure of 150 psi. They are resilient-seal, gate valves, designed for controlling flows. Check valves are automatic ball type incorporating a hollow iron, natural rubber-covered ball. Seals are also made of natural rubber. All fasteners are made of stainless steel. Each pump has a ball check valve and a resilient-seal gate valve on the discharge line. The check valves prevent the reverse flow of wastewater through the nonoperating pumps. The gate valves are closed to allow maintenance and repair work on the pumps and must be reopened before pumps are operated to prevent pump damage.

4.4.3 Piping and Fittings

All buried wastewater piping is polyvinyl chloride (PVC) or high-density polyethylene. All aboveground wastewater piping is flanged ductile iron pipe lined with cement mortar. Flexible flange coupling adapters and flexible couplings are used where required and are rated for 250 psi working pressure.

When operated, the gate valves should be opened to full-open and closed to full-close, and operated at least monthly to ensure proper operation. The check valves are designed to be essentially maintenance and clog free. If for any reason the valve on the idle pump line does not seal when the opposite pump is operating, it may be cleared by operating its associated pump. If this is not successful, the valve should be removed and cleaned or replaced if damaged.

Flexible couplings and pipe fittings should be inspected for leakage during pump operation, and the flexible couplings replaced as required when aging and wear cracking occur.

4.4.4 Wastewater Flow Meters

The Versaflow system is installed downstream from the CFA-1718 lift station to record the volume of wastewater discharged to the lagoons. It functions using a multi-process transmitter and a pair of transducers. Flow measurement is accomplished by passing a continuous beam of sonic energy into the wastewater stream. The frequency shift of the sonic energy received back from the process is then analyzed for flow. The flow meter is factory calibrated and is checked for function and meter readings during normal operational surveillance rounds.

The volume of wastewater discharged to the lagoon is recorded on a totalizer. System operators read and record the daily volume discharged.

A McCrometer® saddle flow meter is installed on the mainline between the Lagoon 3 effluent pump and the center pivot. This flow meter is described as part of the pivot pump system in Section 4.4.9.5.

4.4.5 Pressure Main

Flow to the wastewater treatment lagoons is through a 6-in.-diameter pressure line. The line is designed so that a minimum of 5 ft of cover is maintained and all high spots in the line are supplied with automatic air release/vacuum breaker valves. The pressure line terminates at the inlet structure in Lagoon 1. The pressure line can also be configured to discharge directly into Lagoons 2 or 3.

Proper function of the pressure line requires velocities to be maintained between 3.5 and 8 ft/s. Under most normal flow conditions, operation of the lift station pump provides sufficient velocity to ensure that solids, grit, and other material will not settle out in the pressure line, causing maintenance problems.

After periods of extremely low flow or after prolonged periods of shutdown for maintenance or emergency reasons, the pressure line would be purged by the operation of the discharge pump for a prolonged period (2 hours or more) to generate sufficient velocities to pick up settled solid material and force it to the discharge point.

Additional concern for proper operation of the pressure line is maintaining sufficient earth cover over the pipeline to avoid freezing problems during those times when the water in the pipeline is not flowing. No line freezing has occurred during the past 16 years of operation.

Thrust blocking is installed at appropriate points in the pressure line to prevent pipe movement.

To ensure proper operation of the pressure line, it is important that entrapped air in the effluent be allowed to escape the water and exit pipeline. For this purpose, air relief valves have been installed to relieve accumulated air in the pipeline (see Figure 4). Operator maintenance on the air valves consists of periodic checking to ensure proper operation.

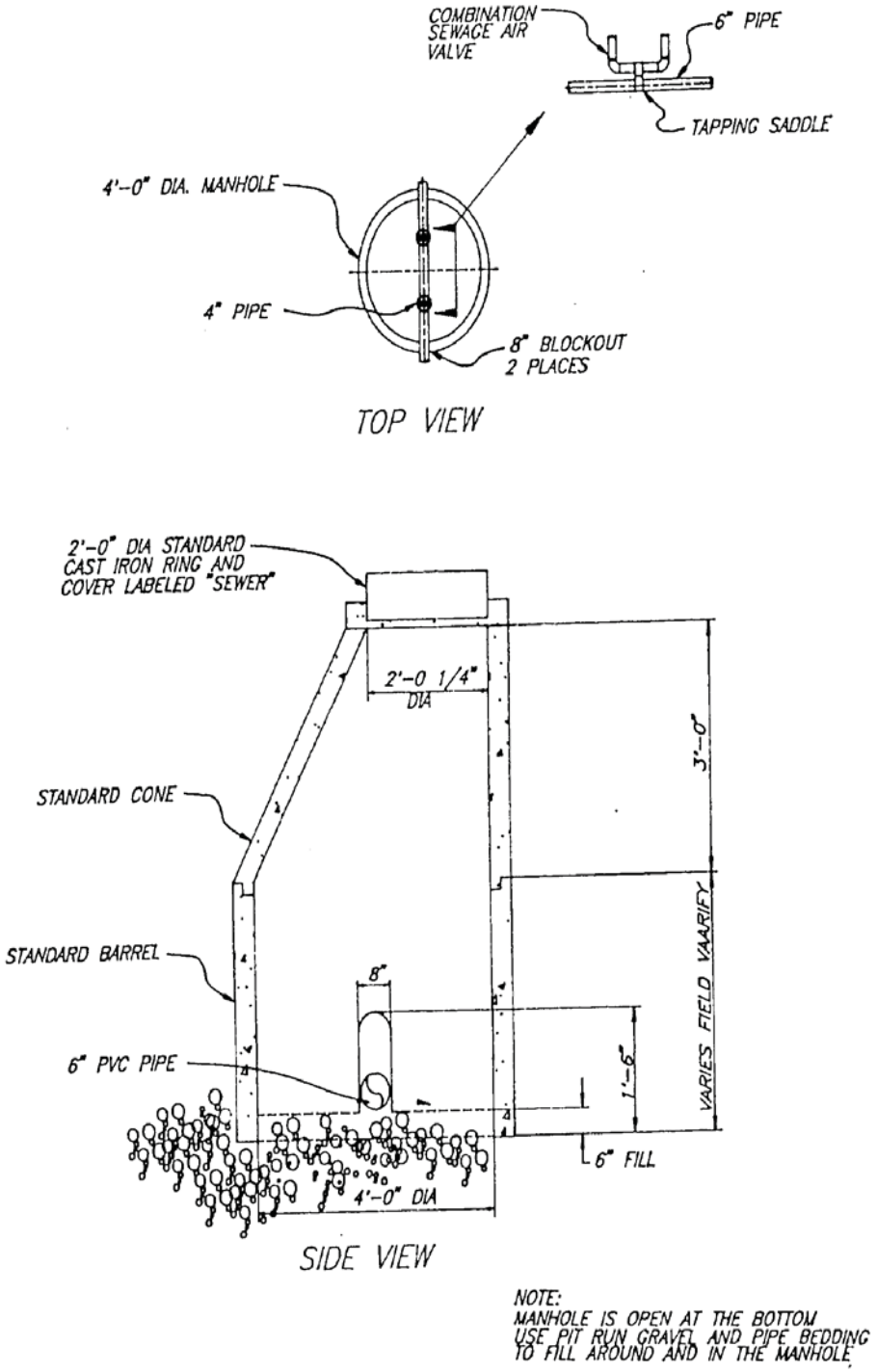

Figure 4. Combination air release valves.

The air relief stations provide a valve on the main discharge line and a tee fitting where the air valve apparatus is attached to the main line, which can be used in an emergency for entrance to the pressure line, should the need for mechanical cleaning or other internal pressure line maintenance occur.

4.4.6 Lagoon System

The wastewater treatment lagoons, shown in Figure 5, stabilize wastewater by using the same biological mechanisms normally present in lakes and streams. These biological mechanisms use complex natural processes involving sufficient detention time, oxygen, sunlight, algae (simple one-celled microscopic plants), and bacterial action.

The decomposition of raw sewage is accomplished mainly in the first lagoon by bacteria, which use oxygen for growth and energy in breaking down wastewater. This process is augmented by the use of mixer-aerators, which supply oxygen and suspend the solids by a mixing action in the wastewater. Oxygen supports and stimulates biological activity, which treats the wastewater. Mixing also reduces the potential for thermal stratification that could allow warmer influent to flow over the colder deep water and short circuit the lagoon. Influent to the first lagoon may often be light gray. As the wastewater passes into and through the system, it becomes green from algae growth. The green color created by algae indicates a good, healthy condition associated with high pH and an active biological process.

Flow between the lagoon cells is controlled by the weir or sluice gates in concrete transfer structures, shown in Figure 6, which allow or prevent flow from entering any one of the discharge pipes. Flow through the lagoons to the pivot pump well is entirely by gravity. As mentioned, options are available to direct influent either to Lagoon 1, 2, or 3 or to bypass Lagoon 1, 2, or 3 by proper weir gate and bypass valve configurations.

4.4.7 Normal Operation

For normal operation, the wastewater is collected at the lift station and is then pumped through the pressure line to Lagoon 1. The wastewater then flows by gravity from Lagoon 1 to Lagoon 2 and to Lagoon 3 through the transfer structures. The wastewater from Lagoon 3 flows into the outlet structure and is then pumped out to the pivot irrigation system.

Lagoon 1 is the primary treatment lagoon. It is operated at a water depth between 7 and 8 ft. This depth is necessary for the mixers-aerators to work most efficiently, to ensure complete treatment and to protect the lagoons bentonite liner.

Lagoons 2 and 3 can be operated between 2 and 8 ft deep. The lagoons are at their peak level during April or May and at their lowest level in September or October. Levels in the lagoons are controlled by operating the weir gates or the sluice gates in the transfer structures and by removing water from the lagoons with the Pivot Irrigation System.

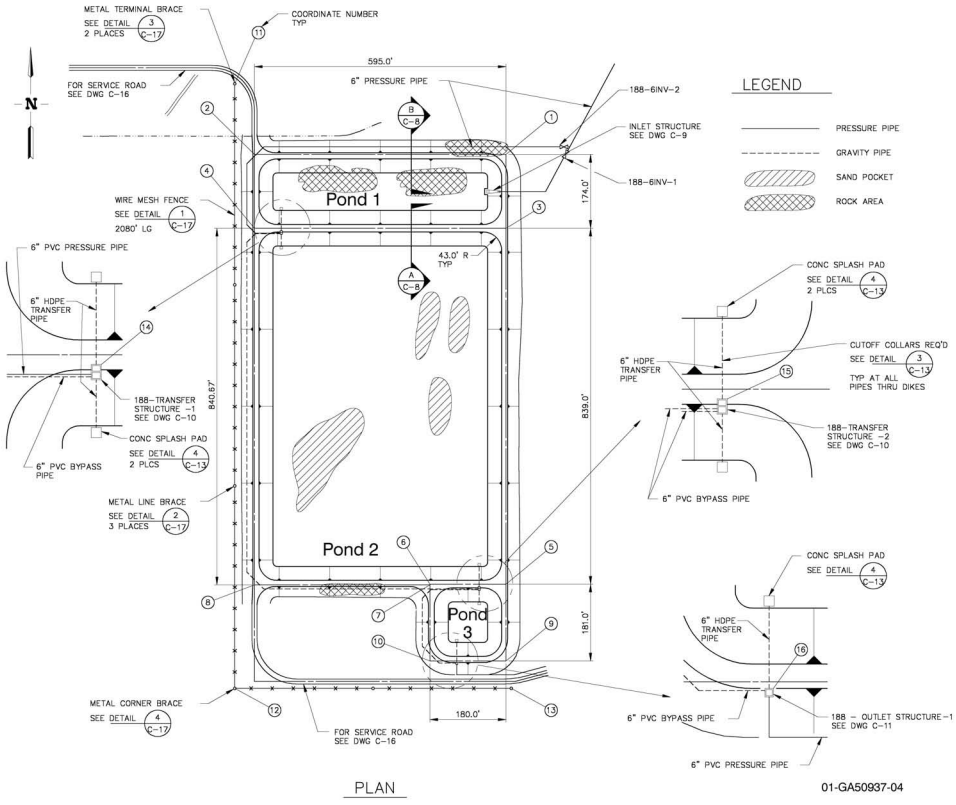

Figure 5. Wastewater treatment lagoons.

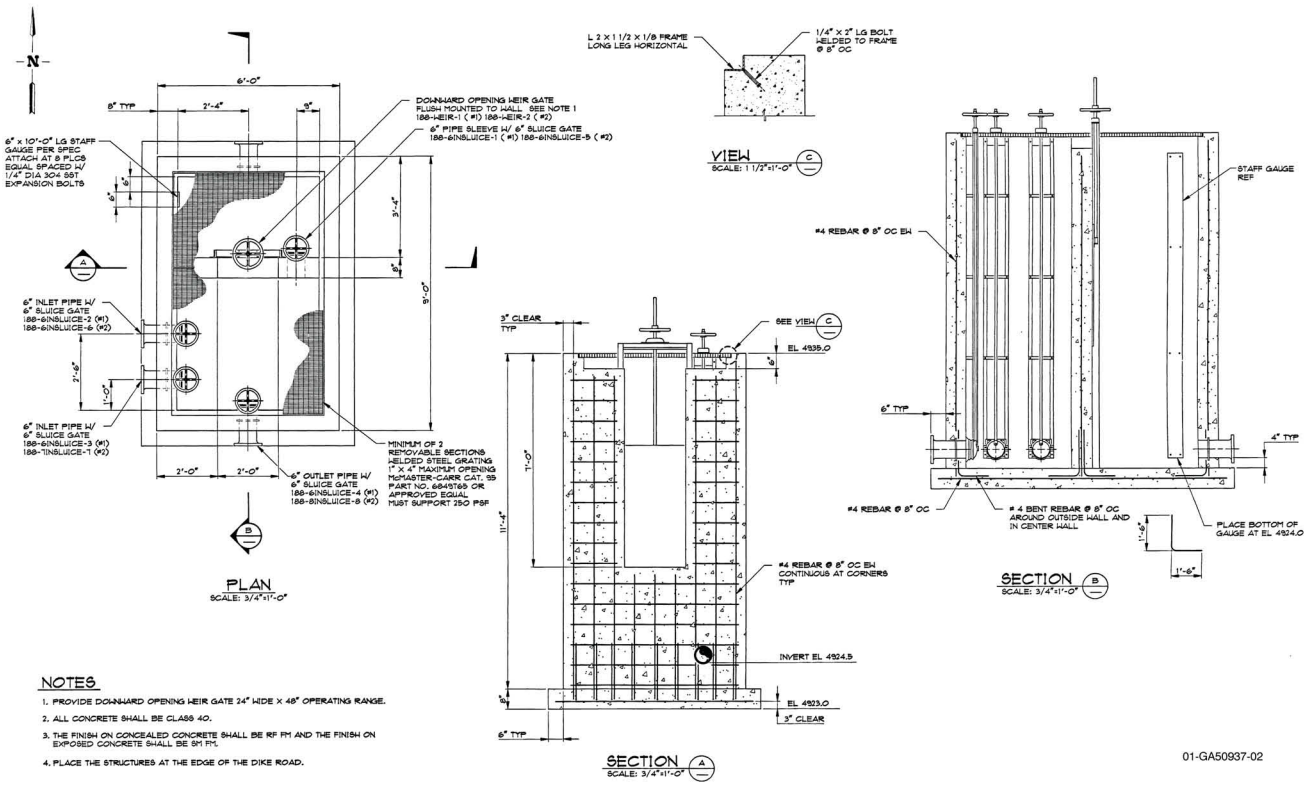

Figure 6. Lagoon transfer structure.

4.4.8 Aeration System

Aeration equipment is used to supply additional dissolved oxygen in the first treatment lagoon to help bacteria rapidly act on the organic material in the wastewater and decompose it into basic elements. The treatment lagoon currently has the capability of operating two mixer-aerators. The mixer-aerators also assist in reducing odors during turnover or high organic loads. For effective wastewater treatment, it is recommended that efforts be made to maintain a minimum 2.0 ppm concentration of oxygen in the treatment lagoon. Operation of the aeration system provides sufficient air to meet the oxygen requirements for reducing odors in the lagoon.

The two existing mixer-aerators are the floating type and consist of a motor, a direct-drive propeller driven at a constant speed, a clog-resistant aspirating venturi nozzle, and a floating support structure, as shown in Figure 7. The approximate current mixer-aerator locations in the lagoon, as shown in Figure 8, were chosen to eliminate short circuiting and maximize mixing. The direction of flow and location can be adjusted as needed to optimize mixing and treatment. Polypropylene and wire ropes are tied to the mixer-aerators and secured to mooring posts in the lagoon embankments to position the units and to pull them into position for maintenance and repairs.

Mixer-aerators are ready for installation as purchased. No adjustment, venting, or oil filling is required. The following items are performed before mixer-aerator unit operations:

- Ensure propeller is rotating in correct direction (clockwise when looking from behind the motor, down the driveshaft)
- Position aerator at approved location and desired depth and check mooring connections to ensure equipment is secured
- Check electrical connections and power cord to ensure it cannot get into propeller.

For efficient mixer-aerator operation, the water level should be 2 ft above the propeller tip. Water levels below this point will result in lost mixer-aerator performance cavitation, high levels of vibration, poor hydraulic balance on the propeller, which is detrimental to long aerator life, and a high degree of splashing.

Trouble shooting information and manufacturer-suggested periodic maintenance procedures for the aerators are located within vendor data submittals and from the manufacturer. Manufacturer's manuals are maintained at the sewage treatment plant office and shall be considered the primary source of information related to operating and maintaining the aerators.

4.4.9 Process Controls

Because of the inherent stability and reliability of lagoon treatment systems, few process controls are required. The main process controls used at the CFA STP are real-time field measurements and seasonal operational variations.

4.4.9.1 In-Process Laboratory Control

The three main operational monitoring parameters used to indicate the stability of the lagoon treatment process are dissolved oxygen, pH, and temperature. Table 4 shows the desirable range of values for these parameters.

Table 4. In-process monitoring.

Parameter	Desired Level
Dissolved oxygen	Above 2 mg/L
pH	6–10
Temperature	32.5–77°F

Dissolved oxygen, pH, and temperature are measured weekly as indicators of treatment stability. Measured values are recorded as a record of performance. The time of day for the tests varies occasionally so that the operator becomes familiar with varying cell and time-of-day characteristics. Usually, pH and dissolved oxygen are lowest just at sunrise. Both get progressively higher as the day goes on, reaching their highest levels in the late afternoon.

System operators also observe the lagoons appearance, odor, color, and look for evidence of short circuiting that could affect the treatment efficiency. Any rapid or significant change in any of these items could indicate imminent process upset. If monitored parameters are outside the normal ranges and the condition is believed to have resulted from a change to a discharge source, CFA facility managers will be contacted to investigate and correct the discharge source. Corrective measures as described in Appendix B would be applied as needed.

4.4.9.2 Seasonal Operation

During warm, summer months, algae, and aquatic vascular plant populations tend to be high in the lagoons. Plant material in the lagoon effluent increases the concentration of suspended solids applied to the soil.

During the winter months, lagoon cells become covered with ice and snow except in the areas near the mixer-aerators. Because sunlight is no longer available to the algae, and with the reduction of oxygen available to the wastewater through wave action and surface transfer, the dissolved oxygen level drops and aerobic decomposition slows down considerably. Anaerobic decomposition of solids then begins to take place, but it occurs at a slow rate because of low temperatures. During periods of ice cover, odorous gases are formed by anaerobic decomposition and they accumulate under the ice and in the wastewater.

Some odors may be perceived in the spring just after the ice cover breaks up, because the cells are in an anaerobic state and some dissolved gases are being released as the lagoons turn over. The breakup of the ice in the spring again makes oxygen available to the water, allowing the cells to recover and become facultative within a few days. In the facultative condition, aerobic decomposition takes place and production of odor is minimized.

A similar problem with odors can occur in late fall as algae and aquatic vascular plants begin to die off in large masses because of cooler temperatures. Dead plant cells become waste organic matter to be "treated" and can temporarily overload a cell or the whole system by demanding more bacteriological action than the available oxygen in the water will allow. Anaerobic digestion (which causes gas and odors) can then begin to occur. Oxygen added to the system through operation of mixer aerators could help overcome the adverse conditions.

The STP is situated at a significant downwind distance from occupied CFA buildings. No odor complaints have been received during historic operations.

Water covers the bottom of the lagoons at all times to protect the liner. If the liner dries out, cracking may occur. Liner erosion protection is provided by riprap on the inside of the embankments. The water depth in Lagoon 1 is maintained at 7 to 8 ft and the depth in Lagoons 2 and 3 may vary from 2 to 8 ft

based on seasonal operations. The lowest operating depth occurs during the fall when the water is pumped from Lagoon 3 for land application to create storage capacity for the winter months. The greatest depth usually occurs in the spring when the ice has melted but ambient temperatures have not warmed enough for significant evaporation.

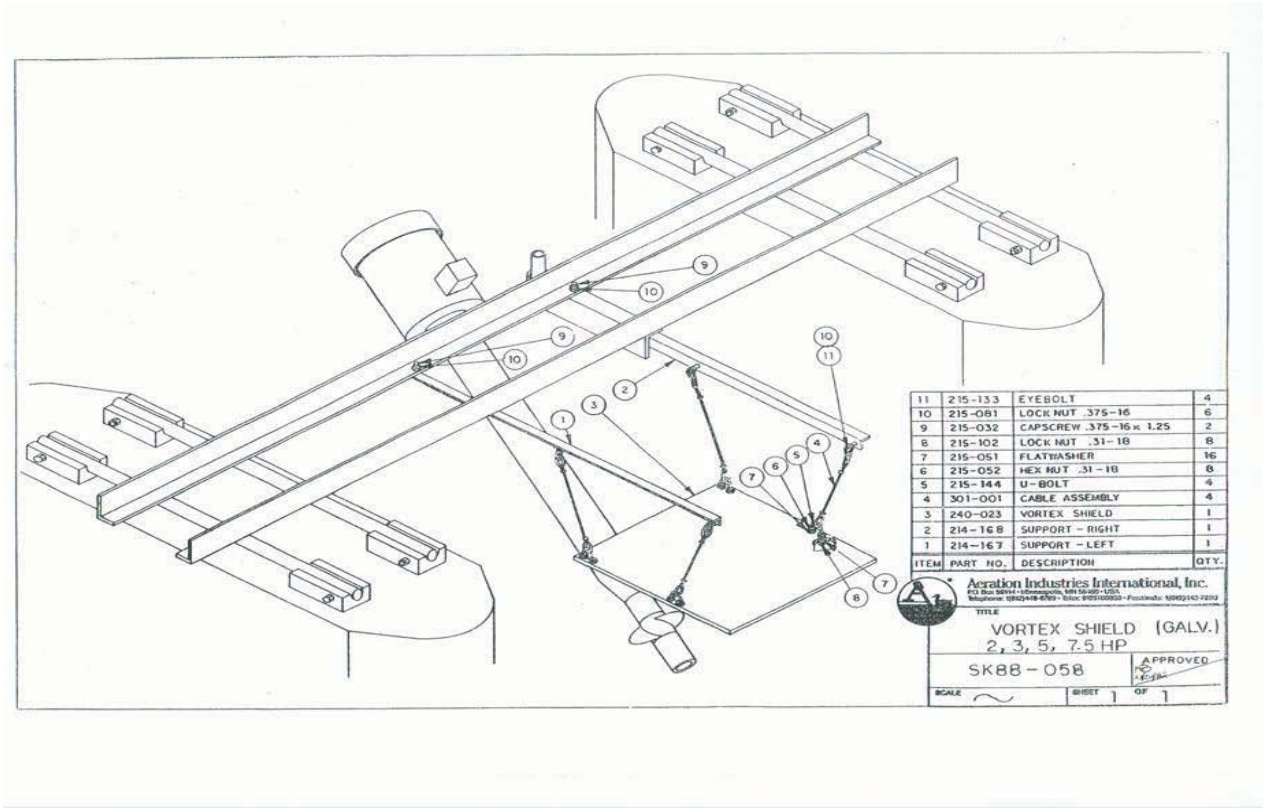

Figure 7. Mixer-Aerator schematic.

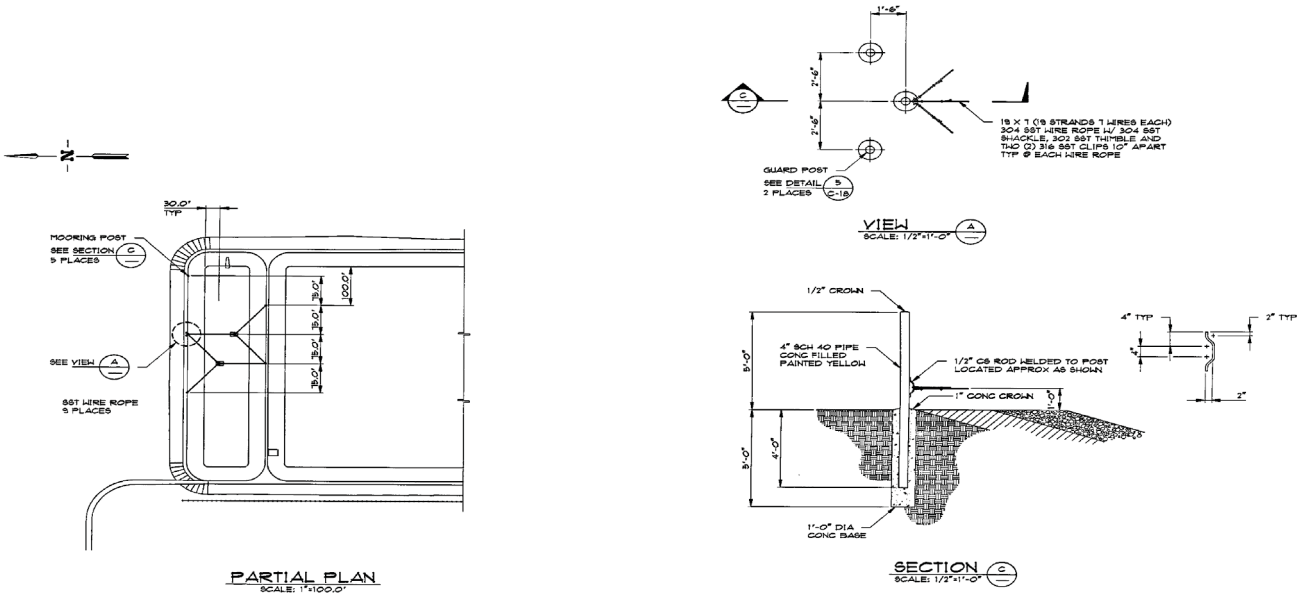

Figure 8. Mixer-Aerator position within primary treatment lagoon.

4.4.9.3 Operator Maintenance

Most problems that arise regarding lagoon treatment systems result from neglect or poor housekeeping. The following is a summary of day-to-day operational maintenance duties that will help to ensure peak treatment efficiency, as well as improving plant appearance. A Lagoon Operation Maintenance Guide is located in Appendix B. This guide outlines a list of potential problems, their cause, and how to control them.

Embankments

The top and interior embankments are maintained to control weeds and other plant growth, especially aquatic plants such as cattails, reeds and willows. The outside embankment has been stabilized with grass. The embankments are inspected each year and noxious weeds are eliminated as required. Care is taken to prevent weeds and debris from blowing or falling into the lagoons. Figure 9 shows the embankment cross-section.

The lagoon embankments are also inspected for evidence of burrowing rodents (muskrats, ground squirrels, badgers, etc.), leakage, or erosion. Frogs, fish, and waterfowl on or in the lagoons are signs of healthy aerobic lagoons. However, burrowing rodents can severely damage side slopes, create water leaks, and damage equipment. If rodents move into the lagoon, they will be controlled to minimize damage.

The inlet structure and splash apron are inspected daily and cleaned as needed.

Grease and Trash Removal

Excessive grease and trash have not been problems during the historic lagoon operations. Some grease and scum on the surface, especially in the first section of Lagoon 1, is expected and acceptable to normal operations. However, it should not be permitted to completely cover the surface, which would interfere with the aeration process. Floating trash that excessively accumulates in the lagoon (especially in leeward corners) is removed as necessary.

Scum Control

Scum accumulation is a common characteristic of lagoons and is usually greatest in spring when growth of water weeds and vigorous biological activity resumes. Ordinarily, wind action will dissipate scum accumulations and cause them to settle. However, in the absence of wind, other methods of removal may need to be considered.

If scum is not broken up, it could dry on the surface of the water and become crusted. Blue-green algae is apt to become established on the scum crust. Formation of blue-green algae can give off disagreeable odors, and it may cut off a significant amount of sunlight into the lagoon. When this happens, production of oxygen by algae inside the lagoon will be reduced, which may result in other odor problems. Methods for breaking up the scum include agitation with rakes from the shoreline or jets of water from pumps or tank trucks. Scum is broken up most easily if it is attended to promptly.

Odor Control

Odor will occur when there are anaerobic conditions in the wastewater, formation of blue-green algae, or during seasonal changes. Odor may also occur if lagoons are overloaded. Overloading will occur when a high die-off of algae bloom occurs. The dead algae create an extremely large and sudden BOD to the lagoon cells, frequently causing them to go anaerobic with associated odor problems.

Possible odor controls include supplementary aeration, recirculating the lagoon effluent, or reducing the strength of the influent (see Appendix B).

4.4.9.4 Transfer Structures

All control valves and gates in the system are operated periodically to ensure they will work when needed. In addition to operating valves, transfer and outlet structures are inspected daily to ensure that they remain free of obstructions or flow restrictions. Earth berms adjacent to the concrete transfer and outlet structures are periodically inspected to ensure against water leaking or possible "piping," which could eventually erode the bank. Ice buildup on the transfer structures is watched, especially on the flow-through pipes and interior walls to ensure that water is flowing between the lagoons.

4.4.9.5 Pivot Pump

Treated wastewater is pumped from Lagoon 3 to the pivot irrigation system. The pump is located in the outlet structure on the end of Lagoon 3.

One 15-horsepower pump is installed in the outlet structure, with a pumping capacity of 350 gpm at 115 ft of total head. The operators control the pump manually.

Before starting the pump, the proper status of the following items must be visually confirmed:

- Outlet sump water level must submerge bottom impeller
- Driver lubrication levels must be adequate
- Pump lubrication system is operative, with adequate levels
- Pump is properly adjusted
- Pump rotation is counterclockwise when viewed from the top
- Discharge system is in condition to accept full flow
- All covers and guards are in place.

When all these conditions are satisfied, the pump may be started and the operation observed closely. If there is excessive vibration, unusual or excessive noise, or if the driver draws noticeably more power than expected, the pump should be stopped.

If the tube leaks at the tension nut, the locknut and packing ring at the top should be checked. If this is not the cause, it may be necessary to apply more tension on the tube. The pump should be stopped and the tension nut flange moved around one or two more holes, working through the access openings in the discharge head.

With an open line shaft pump, the packing box should be observed. The gland should be adjusted to allow very slight leakage at the top for cooling. Leakage will serve to protect the shaft and add life to the packing. The drain line should show a positive flow from the lantern ring. The shaft and the box should not exhibit excess heat.

A McCrometer® saddle flow meter is installed on the mainline between the pump and the pivot. The flow meter has an instantaneous flow rate indicator and a straight-reading six-digit totalizer that records the flow to the nearest 100 gal. System operators monitor and record the totalizer readings and the volume of wastewater applied during each operating day. The flow meter is removed periodically (e.g., every 3 years) and returned to the manufacturer for calibration.

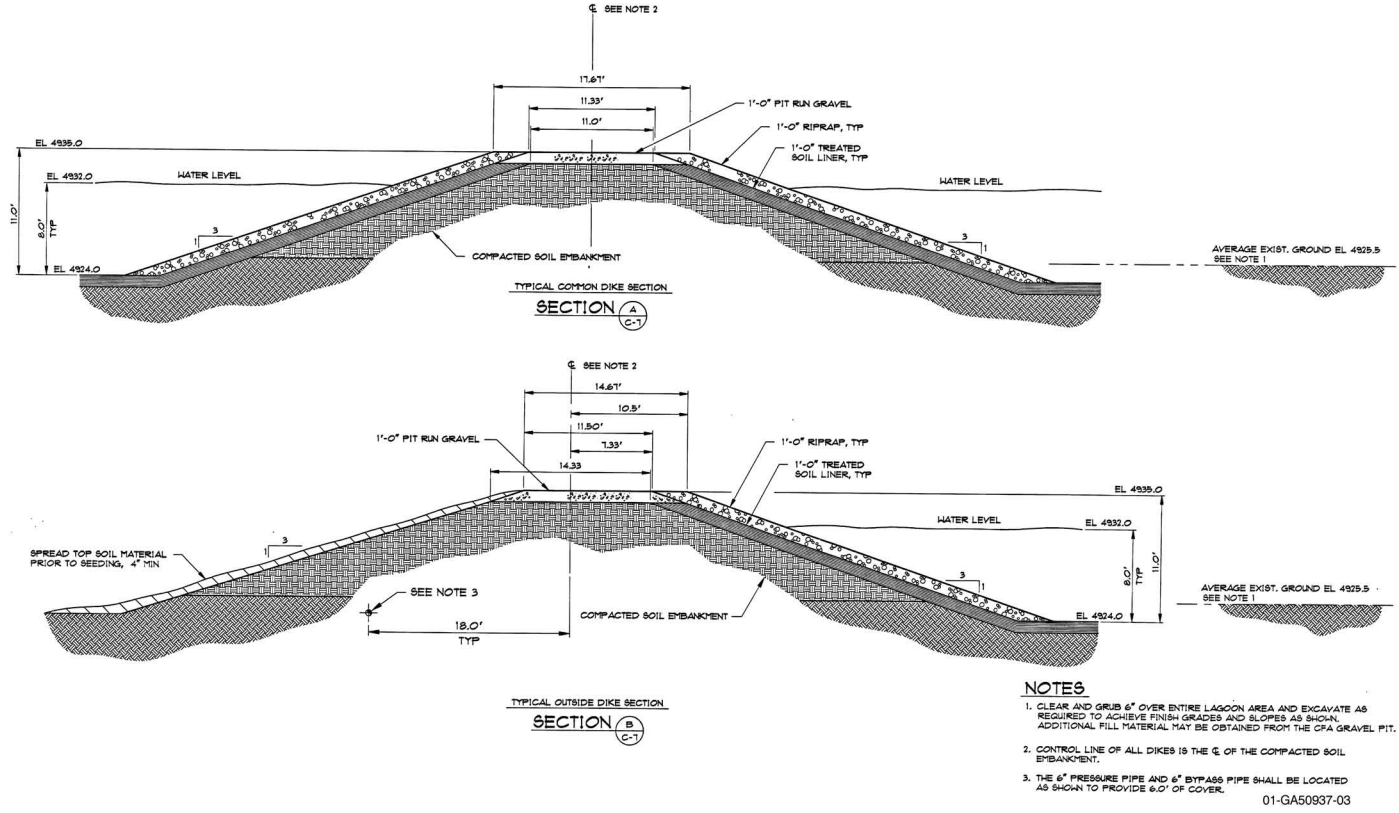

Figure 9. Dike cross sections.

4.4.10 Pivot Pump Maintenance Operations

For pump oil lubrication, a light turbine oil equivalent to Standard Oil O.C. Turbine Oil 32 should be used, or a good grade of mineral oil with proper additives having a viscosity equal to Society of Automotive Engineers (SAE) 10. The lubrication system should always be checked to be sure it has plenty of oil and is operating any time the pump is running. Old oil from the driver should be removed at least once a year or according to the driver manufacturer's instruction. All shaft packing on open line shaft pumps should be replaced after maintenance has required the addition of no more than two rings.

The operator must be aware of changing conditions in the system. Any change from the original conditions or any variation in the system can create an undesirable reaction in the pump as the energizer of the system. For example, if system head has increased the following should be checked: the impeller adjustment, the thrust-bearing capacity, the performance curve, and other details for the new conditions. If it becomes necessary to work on the equipment, all instructions for operation and maintenance should be reviewed.

4.5 Pivot Irrigation System

The pivot irrigation system is fed from the lagoon system through the pivot pump. The system can be operated from April 1 to October 31 (214 days/year) to dispose of the treated effluent from the lagoon system. The pivot irrigation system has the capability of placing water on a circle at prescribed rates to avoid an overloading of water or nutrients to the soil.

4.5.1 Application Rate

Treated wastewater may be applied to the land from April 1 through October 31 (7 months of the year) and stored from November 1 through March 31 (5 months) as stated in the permit. No more than 37 MG or 18.5 acre in./acre may be applied to the 73.5-acre application area each year. Daily flow meter readings are taken and recorded to maintain a running total of the application amounts. Typically, only about 0.1 in. of water is applied to the application area per pivot operational day. Water will not be applied during periods of significant rainfall to reduce the potential for runoff. Water will not be applied to frozen or snow-covered ground or on saturated soils where ponding might occur that allows the wastewater to putrefy or support vectors or insects.

To ensure compliance with the permit requirements, operators work closely with Environmental Support personnel.

The system equipment includes pivot, suspended pipeline, nozzles, end gun, wind speed monitor, flow meter, valving, motors to drive the wheels, and a computer-aided management system. Detailed descriptions of each piece of equipment as well as manufacturer-suggested maintenance procedures/ schedules are located in vendor data submittals and manufacture equipment manuals maintained onsite at the treatment plant. The flow meter is returned to the manufacturer periodically for calibration.

If the pivot flow meter fails to operate properly, land application would typically be discontinued until repairs/replacement could be made. If land application could not be paused, the volume of water applied would be estimated using the pump curve values and hours of operation.

4.5.1.1 Weed and Insect Control

Weed control is an essential part of good housekeeping and is not a formidable task with the use of modern herbicides. Weeds around the edge of the lagoon cells are objectionable because they allow a sheltered area for the breeding of mosquitoes and also an area for scum accumulation. When weed growth

is excessive, root systems have been known to penetrate lagoon seals and create a greater leakage potential.

If mosquitoes or other similar insect problems arise, it will be necessary to eliminate their breeding areas within and around lagoons. This can be done by spraying of the area with mosquito control chemicals and by eliminating standing water outside of lagoon areas.

Extreme caution is exercised with the use of pesticides near the lagoons since residual amounts may be passed through the treatment system to the pivot irrigation. All pesticides used are applied under the supervision of a licensed applicator in accordance with label directions.

Aquatic vascular plants (e.g., chara, coontail, water milfoil) have become so abundant in Lagoons 2 and 3 that they can form surface mats when the water level is pumped down. The plants provide oxygen to the water during daylight but consume oxygen during nighttime. Additionally, the plants become trapped in the winter ice and are pulled up as the winter water/ice level raises. Dead and decaying plant materials add to the oxygen demand. The plants can be somewhat controlled using herbicides or biological means such as grass carp. Lagoons 2 and 3 were stocked with grass carp during 2008 and 2010. The carp appear to have partially controlled vascular plant growth.

4.5.1.2 Solid Waste Management

Sewage sludge consisting of settled waste solids, inorganic waste constituents, active and dead microbial cells, algae, and other materials (e.g., windblown sand and debris) is accumulating in the CFA STP lagoons, mostly in the primary treatment lagoon. Proper operation of the lagoons requires a liquid treatment zone above the sludge zone to facilitate simultaneous facultative and anaerobic treatment processes. Excessive sludge accumulation can reduce the liquid treatment zone and the wastewater holding time within a lagoon.

The CFA STP was designed for a minimum 20-year service life. The 1993 Wastewater Land Application Permit (WLAP) application stated, “No significant sludge accumulation is expected in the lagoons during the 20 year operating period. After this period, when sludge requires removal, it will be used or disposed of in accordance with applicable state and federal regulations.”

The amount of sludge accumulated in Lagoon 1 was measured in 2006. Sludge depths ranged from 0 to 2.1 ft with an average depth of 0.9 ft. The accumulation rate averaged about 1 in./year of STP operation. The measured sludge volume occupied approximately 10.5% of the volumetric capacity of Lagoon 1. The volume of wastewater discharged annually at CFA has declined from around 115,000 gal/day during the initial years of STP operation to around 55,000 gal/day during recent years due to reductions in buildings and personnel. The characteristics of the wastewater have not changed significantly so the anticipated rate of sludge accumulation should also decline. Sludge measurements will be repeated on a 10-year cycle to monitor the accumulation rate.

At some future date, the STP sludge solids may accumulate in one or more of the lagoons to the point they must be removed. At that time, the sludge will be sampled and characterized and a detailed management plan will be prepared and submitted to the DEQ for approval. The detailed plan will address the following topics:

- Continued or alternative STP operations during solids removal
- Regulatory requirements
- Sludge characterization results and waste classification
- Sludge stabilization plans (e.g., in-situ drying, mixing with a dry material, mechanical dewatering or other appropriate means)

- Solids disinfection (e.g., mixing with lime, if needed)
- Solids disposal (e.g., burial in place, INL or offsite landfill, off-site incinerator, or use as a soil amendment at reclamation sites).

Small volumes of solid waste are generated from STP maintenance activities such as replacement of system components and lift pump cleaning. These wastes are bagged and disinfected as needed, and disposed of at the INL landfill. As a precaution, all waste generated from the CFA STP collection system is screened for radioactivity. Any waste that exceeds the screening criteria would be bagged and tagged for appropriate additional analysis, treatment, and disposal.

4.5.2 Application Area Runoff Management

A Runoff Management Plan for the CFA STP was prepared and submitted to the DEQ in 2006 (*Runoff Management Plan for the Central Facilities Area Sewage Treatment Plant Land Application Area,* INL/EXT-06-1067, January 2006). The plan evaluated best management practices (collection basins, berms, etc.) that may be needed to prevent runoff from the land application to adjacent property. The evaluation determined that runoff would be effectively controlled by infiltration into the native soil on the application area. Field studies performed on the application area and at nearby sites with similar soil properties indicated that a 24-hour rainfall event of at least 3.1 in. combined with typical spring soil moisture conditions and typical operation of the CFA STP center pivot system (0.1 in./day) could be expected to infiltrate into the application area without creating wastewater runoff. The 3.1 in. of precipitation is a substantially greater infiltration capacity than the 25-year, 24-hour event of 2.10 in. required by the previous permit Compliance Activity 141-06. Therefore, inherent soil properties will control runoff. Additional controls or other best management practices are not required to contain runoff from the permitted land application property.

Periodic inspections of the application area perimeter are performed to look for indications of runoff (e.g., erosion channels, ponding outside the application area) and to inspect application area perimeter signs.

4.6 MONITORING

Monitoring requirements specified in the Municipal Wastewater Reuse Permit and additional operational monitoring are performed for compliance and operational control. All permit-required monitoring (except flow readings and total coliform analysis) is conducted by the INL Environmental Monitoring Program and will be referred to in this document as “Compliance Monitoring.”

If results of either compliance or operational monitoring indicate plant upset, abnormal conditions, insufficient treatment, or potential noncompliance with the Wastewater Reuse Permit, STP operations personnel, and Compliance Monitoring personnel will inform Environmental Support as soon as possible and changes will be made to correct the problem or adjust treatment. In addition, Environmental Support personnel will make the required notifications to Department of Energy Idaho Operations Office (DOE-ID) and DEQ as specified in the permit.

4.6.1 Operational Monitoring

Routine operational monitoring includes recording the daily volume of influent pumped from the lift station to the lagoons and weekly measurements of water temperature, pH, and dissolved oxygen in the influent to Lagoon 1 and the water in Lagoon 2 or 3. The following general guidelines are followed for operational monitoring:

- Samples are generally taken from the influent apron or the transfer structures between lagoons where the wastewater is mixed.

- Sample measurements are taken immediately with a field instrument and are recorded on log sheets.
- Proper sampling equipment and safety precautions are used when collecting and analyzing the samples.

4.6.2 Operational Parameters

4.6.2.1 Hydrogen Ion Activity Values (pH)

Bacteria actively involved in the digestion of waste material in the lagoon do best when the pH is between 6 and 10, which is the typical range of domestic sewage lagoons. Discharge of chemical wastes into the sewer system could affect the pH and reduce the effective treatment and damage the system components. There are no processes or activities at CFA that have the potential to discharge large quantities of low or high pH wastewater.

Higher pH values in lagoons are typically associated with algae that consume CO_2 and then bicarbonate ion. Elevated pH conditions can benefit the lagoon by causing the dissociation of odor-causing H_2S molecules, enhancing pathogen inactivation and die-off and aiding in the volatilization and removal of ammonia.

4.6.2.2 Dissolved Oxygen

Dissolved oxygen (DO) represents the concentration of free oxygen in the wastewater readily available to the bacteria, which require it for digestion of the organic materials in the water. The amount of DO in water depends on temperature and BOD: the cooler the water, the greater the ability to retain dissolved oxygen. The DO level in the lagoons should normally be 2 mg/L or higher.

By watching trends in oxygen levels of the influent, the operator can track the strength of the incoming waste load. A higher BOD requires more DO for proper treatment. Maintaining a DO level of 2 mg/L in the lagoons should be sufficient to minimize odors and provide proper treatment. The amount of DO can be increased by running the aerators and/or lowering the level of the lagoons. Influent entering Lagoon 1 typically exhibits DO of 1–5 mg/L. Water flowing from Lagoon 1 into Lagoon 2 typically has a DO of 7–10 mg/L.

4.6.3 General Monitoring Requirements for Lagoon Operation

Table 5 summarizes operational monitoring conducted by the CFA STP operators. Sample collection and analyses are performed using calibrated instruments. Some of the listed monitoring actions support both operational monitoring and reuse permit compliance.

Table 5. Operational monitoring guidelines.

Parameter	Frequency	Monitoring Point
Flow	Daily	Flow meter at lift station
	Daily when land applying	Flow meter at to pivot irrigation
Dissolved Oxygen	Weekly	Influent to Lagoon 1 Water from Lagoon 2 or 3 (weather permitting)
pH	Weekly	Influent to Lagoon 1 Water from Lagoon 2 or 3 (weather permitting)
Temperature	Weekly	Influent to Lagoon 1 Water from Lagoon 2 or 3 (weather permitting)

4.7 Compliance Monitoring

The INL Monitoring Services group performs all permit-required effluent monitoring, with the exception of flow readings collected by the CFA STP operators.

All monitoring conducted under the Environmental Monitoring Program involves sampling, analysis by appropriate laboratories, and data interpretation carried out under a rigorous quality-assurance program. All methods used in the analysis of the samples are Environmental Protection Agency (EPA) approved methods as specified in 40 CFR 136, 40 CFR 141, 40 CFR 143, or as approved by the DEQ.

Samples of effluent are collected monthly from the center pivot pump station. A grab sample is collected for immediate pH analysis and for transport to the laboratory for total coliform analysis. A flow proportioned composite sample is collected during one operational day for the center pivot irrigation system for analysis of the remaining parameters.

Further information on compliance monitoring sampling procedures is contained in INL guidance documents. For example, PLN-8540 "Idaho National Laboratory Effluent Monitoring Plan," and LI-8540, "Liquid Effluent Sampling," address effluent sampling requirements for multiple INL facilities.

Table 6 summarizes the compliance monitoring requirements outlined in Section G, *Monitoring Requirements,* Section H*, Standard Reporting Requirements* and Section I, *Standard Permit Conditions; Procedures and Reporting,* of the Wastewater Reuse Permit. INL is required to submit an annual Wastewater Land Application Site Performance Report each year detailing analytical results for compliance monitoring purposes.

4.7.1 Analytical Methods

Laboratory analyses, with the exception of pH and total coliform, are performed by offsite subcontract laboratories. All samples are collected and transported under chain of custody program that ensures traceability throughout the transport, storage, and analysis processes. Analysis for pH is performed at the time of sample collection by the Monitoring Services personnel. Total coliform analyses are currently performed at the wastewater laboratory at the Idaho Nuclear Technology and Engineering Center (INTEC). All methods used in the analysis of the samples are EPA-approved methods as given in 40 CFR 136, 40 CFR 141, 40 CFR 143, or as approved by the DEQ.

Table 6. Reuse Permit compliance monitoring and reporting requirements.

Item	Monitoring Frequency	Monitoring Point	Type Of Monitoring	Parameter
Wastewater monitoring	Daily (when land applying)	Flow meter prior to irrigation	Volume land applied	Wastewater Application (GPD)
	Monthly (when land applying)	Effluent to irrigation system	24-Hour composite[a]	TKN, NO_3+ NO_2 as N, COD, TDS, total P
	Monthly (when land applying)	Effluent to irrigation system	Grab[a]	pH, total coliform[b]
	Monthly and annually	Hydraulic Management Unit	Calculation; loading per acre	MG and acre inches
	Monthly[c] and Annually	Hydraulic Management Unit	Calculation; loading per acre	Total N, P, COD, TDS (lb/ac/yr)
Soil monitoring	Oct. 2010 and 2013	10 sample locations	Soil composites[d]	NH_4-N, NO_3-N, EC, SAR, pH, %OM, plant available P (Olsen method)

Notes: Abbreviations are defined as follows:

COD	= Chemical oxygen demand	P	= Phosphorous
E C	= Electrical conductivity	SAR	= Sodium absorption ratio
GPD	= Gallons per day	TDS	= Total dissolved solids or salts (generally includes Na, Ca, Mg, K, NH_4, Cl, HCO_3, So_4, Co_3, Br, Fl.)
MGD	= Million gallons per day	TKN	= Total Kjeldahl nitrogen
NH_4-N	= Ammonium-nitrogen		
NO_3-N	= Nitrate-nitrogen		

a. Grab and composite samples are collected at times and locations that represent typical environmental and process parameters being monitored.

b. Flow proportional composite samples as stipulated in Reuse Permit Section G4.

c. As approved by the DEQ, hydraulic and nutrient-loading rates are calculated annually for each applicable month.

d. The land application area shall be sampled as stipulated in Reuse Permit Sections G5 and G6. Ten locations will be sampled. Three subsamples are taken from each location at depths 0–12 in., 12–24 in. and 24–36 in. These subsamples are taken to be representative of the site. The ten subsamples for each soil depth range are to be composited yielding three composite samples for analysis—one composite sample from the 0–12 in. layer, one from the 12–24-in. layer and one from the 24–36 in. layer.

4.7.2 Loading Rate Calculations

Hydraulic loading rates per acre are calculated as shown below based on assumed uniform wastewater application to the 73.5 acre application area.

$$\frac{Total\ Gallons\ Applied}{73.5\ acres} = \frac{Gallons}{Acre}$$

$$\frac{Gallons}{Acre} x \frac{1\ Acre\ Inch}{27154\ Gallons} = \frac{AcreInches}{Acre}$$

Nutrient, COD, and Total Dissolved Solids (TDS) loading rates are calculated based on the concentrations in samples and are reported as lb/acre. If wastewater is land applied during multiple months, the concentrations in the monthly samples is used as the basis for the monthly loading calculations. The monthly loading rates are summed to determine the annual loading rate.

$$mg/L\ X\ \frac{8.35\,E-06\,lb/gallon}{mg/L}\ X\ \frac{gallons}{acre}=\frac{lb}{acre}$$

4.7.3 Monitoring Quality Assurance

Sampling and analysis plans and activities follow the guidelines of American National Standards Institute (ANSI)/American Society for Quality Control (ASQC)-E4 Specifications and *Guidelines for Quality Systems for Environmental Data Collection and Environmental Technology Programs*, and EPA QA/R-5 *EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations*. The laboratory is required to include the results of QC measurements with analytical results. Data validation is performed to check the QC data against the method-specified detection limits to ensure quality goals were met.

Performance evaluation samples consist of standards with known concentrations (spikes), which are submitted to the analytical laboratory as a regular sample. The performance evaluation sample is used to assess laboratory accuracy; results should be within the performance acceptance limits specified on the QC standards certification. Performance evaluation samples are sent to the laboratory at the discretion of the Liquid Effluent Monitoring Lead.

To quantify laboratory precision, one or more duplicate samples are collected. Equipment blanks and rinsate samples may also be collected to determine uncertainty contributed by field sample collection practices.

Analytical data is systematically assessed to ensure conformance to programmatic QA objectives. The data validation process ensures that data precision and accuracy requirements specified in EPA analytical methods and in the laboratory contract statement of work are met. Accuracy is assessed by results from spike, duplicate, and blank sample analyses and by evaluating the laboratory's internal QC results. To meet the QA objectives, the laboratory results should fall within the concentration ranges specified in certification statements from the manufacturer of the performance evaluation samples.

4.8 Monitoring Summary

The wastewater treatment facility operator is responsible for collecting flow data, and periodic samples (typically weekly) used for operational purposes. Operational monitoring guidelines are presented in Table 5. The INL Monitoring Services group is responsible for other permit-required monitoring as delineated in Table 6. Sample collection activities are performed in accordance with internal company procedures, which are reviewed and updated on a periodic basis. Analytical procedures are performed in accordance with EPA methods or approved equivalents.

In the event of plant upset, or other indications of abnormal condition of the influent to the plant or problem in the plant, more frequent testing would be performed until the source of the problem is identified and the problem corrected. Both CFA STP operators and Environmental Compliance personnel are kept informed of abnormal conditions or monitoring results and coordinate appropriate actions. A trouble shooting guide (see Appendix B) is provided to assist operations in correcting plant upset/abnormal conditions.

5. PREVENTATIVE MAINTENANCE

Maintenance keeps operating systems functional and performing at their required levels. Preventive maintenance is a term used to denote maintenance that prevents failure of systems. The suggestions in this section guide maintenance personnel as they service the CFA STP equipment in accordance with the overall maintenance plan for CFA.

Suggested basic periodic operations and maintenance duties are listed in Table 7. Details of these actions are presented in equipment manufacturer's manuals and in vendor data submittals maintained at the treatment plant. Though the operator is encouraged to use this list as a performance checklist, it is not to be considered all inclusive. The list must be flexible and is subject to review and updating as additional operating experience is obtained or the facilities are modified.

Table 7. Suggested STP operator and maintenance personnel checklist.

	Daily[a]	Weekly	Monthly	Other
Aeration system				
Aeration unit operation	X			
Check shaft plugging/clean[b]				As required
Check evidence of prop fouling[b]				As required
Pivot irrigation system				
Inspect entire system[b]				Semi-annual
Inspect nozzle openings	X			When operating
Check operational controls		X		
Check couplings, fittings, etc.[b]				As required
Replace fuses/lights[b]				As required
Winterization[b]				Annual
Lift station				
Check operational controls	X			
Check couplings, fittings, etc.[b]				As required
Remove, clean, and inspect check valves[b]				As required
Replace fuses/lights[b]				As required
Flow meter				Calibration check every 5 years
Lagoon system				
Observe lagoon appearance	X			
Remove debris from aerated cells	X			
Inspect berms	X			
Check water depth in cells	X			
Control weed growth				As required
Check transfer structures		X		
Inspect side slopes			X	
Check gates, fences, lights			X	
Keep roads clear in winter[b]				As required

a. Monday through Thursday, excluding holidays

b. Conducted by maintenance personnel

Plant operators and maintenance personnel must be familiar with manufacturer specifications/materials associated with each piece of equipment. Scheduled preventative maintenance activities conform to the guidelines outlined in manufacturers' manuals to ensure safe and efficient equipment operation.

Operation and maintenance record files are kept for a minimum of 5 years, and records, report forms, maintenance manuals, reference books, and journals are maintained in a central location for convenient and ready access.

5.1 General Plant Appearance

The appearance of the wastewater treatment plant is generally a good indication of the effort and interest associated with the operation and ability to produce a high-quality effluent. Structures and components are generally made from corrosion-resistant materials that do not require painting. Periodic hosing down of lift stations is required to prevent the buildup of unsightly solid material and associated annoying odors. Grounds maintenance is necessary to control animals burrowing in the lagoon embankments and other nuisance pests. The operators are responsible for identifying and reporting problems that require maintenance scheduling.

5.2 Equipment Maintenance and Scheduling

Equipment information including specifications, manufacturer, model and serial number, and electrical and mechanical data are maintained in vendor data files at CFA. Corrective maintenance is performed as needed to replace or repair defective equipment. Maintenance scheduling priority is risk based. Failures that created emergency situations are addressed immediately whereas lower risk failures are lower priority. Any STP equipment failure that renders the system unavailable or that violates a regulatory requirement would be considered and emergency maintenance priority.

5.3 Supplies and Spare Parts

Most supplies and parts are readily available in Idaho Falls, but may not be available the very moment an item breaks down. As such, spare parts may be maintained at the treatment plant for immediate implementation during an emergency situation. Suggested spare parts include:

Lift Station

- Float valve
- Ball for check valve
- Extra pump

Pivot Irrigation System

- Micro switches between towers
- Nozzles
- Oil for motor lubrication

6. RECORDS AND REPORTING

Keeping an accurate record of performance of the wastewater treatment facility is an integral part of good plant operation. Accurate and readily accessible records are necessary for regulator monitoring and for guiding operating personnel in locating and solving operational problems. These records constitute the proof of performance and serve to justify decisions, expenditures, and recommendations.

6.1 Plans and Specifications

A complete set of the record drawings of the facility is kept and readily available to the operators. Anytime modifications to the physical facility are made, they are noted on this set of plans. These include underground utilities, electrical changes, equipment relocations, and any other construction-related activities. Significant changes will be noted in revisions to this plan of operation.

6.2 Daily Operating Log

A daily operating log is maintained. This log is bound in permanent notebooks to prevent destruction or alteration of these important records. The information contained in this log includes the following:

- Routine operational duties, flow meter readings, sample information with corresponding analytical data, etc.
- Unusual conditions
- Accident or equipment hazard reports.

The information contained in the daily operating log is the basis for each day's entry in the annual report to DEQ and in INL internal reports.

6.3 Operation, Sampling, and Testing Log

An example format for a daily operations monitoring log form is included in Appendix D. The form serves as a suggested guideline for collection of operational data.

Some of the information contained in the operation, sampling, and testing forms will be used to compile information for internal INL reports, and annual Site Performance Reports to the DEQ.

6.4 Summary Reports

Summary reports containing the Operational Monitoring data described in Section 4.7 and pertinent information from the daily operating log must be submitted to Environmental Support. Some of the data contained in these reports will be used to track Wastewater Reuse Permit compliance and to prepare the annual Site Performance Report. The Environmental Support organization is responsible for preparing the annual Site Performance Report for submittal to DEQ.

6.5 Maintenance Records

A maintenance and equipment file is kept to provide a permanent record of all maintenance work completed on all equipment. To have an effective and efficient file, the following items should be included:

- Preventive maintenance records
- Preventive maintenance schedule

- Where spare parts can be purchased
- Spare parts inventory
- Specifications on equipment from supplier
- Equipment inventory.

7. EMERGENCY PLAN

The CFA STP currently operates under a CFA Emergency Plan and implementing procedures that contain general emergency planning and emergency information for all CFA facilities. The plan includes current emergency procedures for initiating coordinated response actions. Emergency procedures are in place for spills, fire, explosion, personnel injury, and water pollution. The plan also details emergency procedures for offsite response interfaces, notifications and communications, protective actions, medical support, training, drills, and exercises.

7.1 Emergency Operation

Successful emergency operation of the wastewater facility depends on plant operators knowing the optional flow characteristics designed into the plant facility, and also knowing, through normal operation and maintenance, all the control valves and emergency equipment are working properly and ready for immediate use. Operational flexibility is designed into the wastewater treatment facility and can accommodate an expected emergency scenario. The only fixed elements are the inlets and outlets.

An overflow condition in the pump station needs immediate attention, which is the reason the emergency power connection, the bypass piping, and redundant pumps are provided. A bypass for the sewage has been provided so that sewage can be pumped around the lift station using a redundant or portable pump in the event of an emergency. Additionally, a separate electrical connection allows a portable generator to provide standby power for the lift station in the event of a power outage. If extraordinary flows come to the lagoons, normally, the high water will have a lower concentration of biological waste, so bypassing a portion of the flow to the facultative lagoon will have little impact. A toxic slug load entering Lagoon 1 can be isolated and treated while sewage is bypassed to Lagoon 2. Isolation of any lagoon can be obtained by proper valve and weir gate operation. The treatment plant can continue functioning while any lagoon is bypassed or pumped down for maintenance.

Appendix A

Wastewater Reuse Permit

Appendix A
Wastewater Reuse Permit

STATE OF IDAHO
DEPARTMENT OF
ENVIRONMENTAL QUALITY

CCN220416.-

900 North Skyline Drive, Suite B • Idaho Falls, Idaho 83402 • (208) 528-2650

C.L. "Butch" Otter, Governor
Toni Hardesty, Director

March 17, 2010

CERTIFIED MAIL

Mr. Raymond V. Furstenau, Deputy Manager
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Mr. Dwayne E. Coburn, Director, Facility and Site Services
Battelle Energy Alliance
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Idaho Falls, ID 83415-3406

RE: LA-000141-03 INL CFA Sewage Treatment Facility, Final Wastewater Reuse Permit.

Dear Sirs:

We are issuing the above referenced Wastewater Reuse Permit. The enclosed document is your official copy of the permit and demonstrates that you are authorized to operate the wastewater land application facility subject to certain specified requirements.

Attachment 1 summarizes the changes made in the final permit. Attachment 2 contains the response to INL's comments received on the January 22, 2010 draft permit. There were no public comments received regarding the draft permit.

Your permit is issued as of March 17, 2010 and expires on March 16, 2015.

We have scheduled a permit handoff meeting for Wednesday, March 31, 2010 at our office to review the terms and conditions of your permit. If this time doesn't work for your staff, or if you have any further questions, please contact Tom Rackow at (208) 528-2650.

Sincerely,

Erick Neher
Regional Administrator

Enclosures

c: Richard Kauffman, DOE-Idaho.
Jo Anna Stenzel, BEA

2010AGH1244

Appendix 2
Site Maps

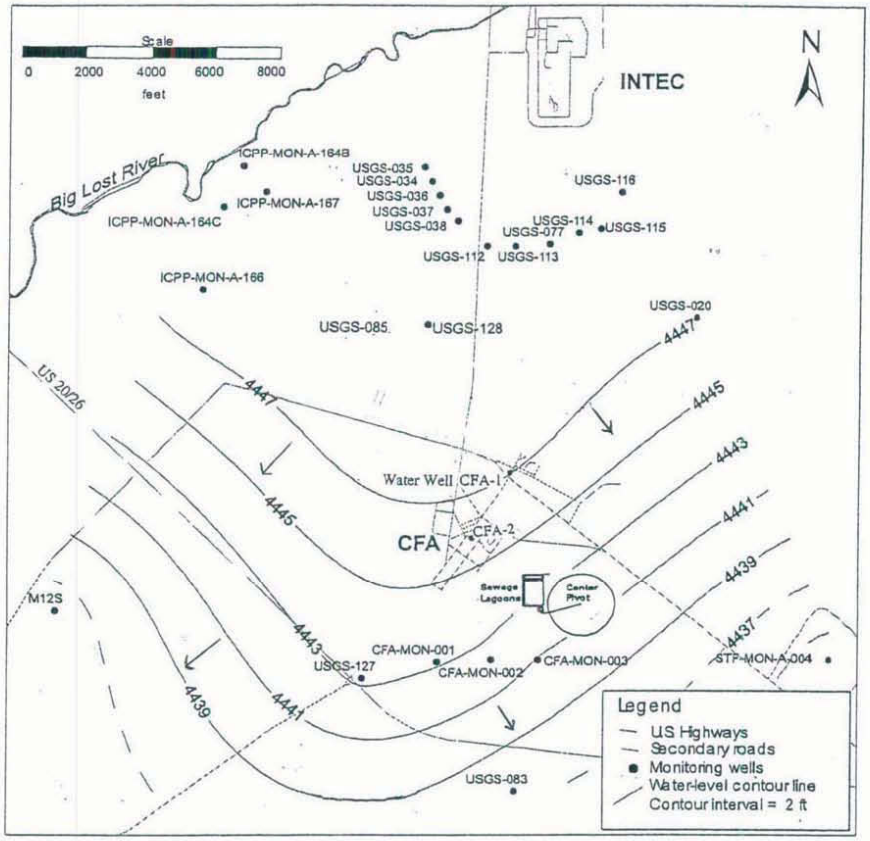

Figure 6. Ground water contours near CFA STP.

Toni Hardesty, DEQ State Office.
Richard Huddleston, DEQ State Office.
Gregory Eager, DEQ Idaho Falls Regional Office.
Tom Rackow, DEQ Idaho Falls Regional Office.
WW Reuse Source File No. LA-000141-03.

Attachment 1
LA-000141-03
Summary of Permit Changes
(minor/non-technical changes are not included in this summary)

1. Section E, Compliance Activity CA-141-02 – The specified completion date for submitting the Seepage Testing Procedure to DEQ for review and approval has been changed from May 31, 2015 to May 31, 2014. The intent of this compliance activity is to perform the seepage test the summer prior to permit expiration and to supply the test results with the permit renewal application. The summer prior to permit expiration will be 2014, not 2015 as incorrectly shown in the January 22, 2010 draft permit. INL was notified of this error and DEQ's proposed change on March 9, 2010 by email from Tom Rackow, DEQ, to Mike Lewis, BEA. BEA responded to Mr. Rackow by email on March 15, 2010 affirming that the change from 2015 to 2014 was acceptable.

2. Section E, Compliance Activity CA-141-03 – The specified completion date for completing the seepage tests and reporting the results to DEQ for review and approval has been changed from August 31, 2015 to August 31, 2014 for the reasons specified in #1, above.

There were no other major/technical changes made to the Final Permit.

Attachment 2
LA-000141-03
Response to Comments

A draft Wastewater Reuse permit was issued to INL and posted to media outlets on January 22, 2010 for review and comment. The Department of Environmental Quality received written comments from INL on February 24, 2010. No public comments were received. Following is the Department's response to INL's comments:

1. **Comment:** Page 2, Section B, Permit Contents, Appendices, and Reference Documents – the page numbering in the Table of Contents is not accurate.

   Response: Page numbers in Section B have been corrected in the Final Permit.

2. **Comment:** Page 2, Section B, Permit Contents, Appendices, and Reference Documents, last paragraph – 'Energy' was spelled incorrectly.

   Response: The spelling has been corrected in the Final permit.

3. **Comment:** Page 4, Section D, Facility Information, Table 2 – In the Legal Name of Permittee, insert 'Office' after Operations to read … Idaho Operations Office.

   Response: The word 'Office' was added to the Final Permit.

4. **Comment:** Page 6, Section E, Compliance Schedule for Required Activities, Table 3 – In the last sentence of Compliance Activity CA-141-01, delete 'cold waste pond' and replace it with appropriate wording. For example: The manual may reference other written procedures required for the operation and maintenance of the wastewater reuse facility.

   Response: The term 'cold waste pond' was incorrect and should have been edited prior to issuance of the draft permit. The term 'cold waste pond' has been changed to 'wastewater reuse facility' as recommended.

There were no other comments received regarding the January 22, 2010 draft permit for CFA.

A. Permit Certificate

MUNICIPAL WASTEWATER REUSE PERMIT
LA-000141-03

UNITED STATES DEPARTMENT OF ENERGY – IDAHO OPERATIONS OFFICE, 1955 FREMONT AVENUE, IDAHO FALLS, IDAHO 83415 AND BATTELLE ENERGY ALLIANCE, LLC, P.O. BOX 1625, IDAHO FALLS, IDAHO 83415 ARE HEREBY AUTHORIZED TO CONSTRUCT, INSTALL, AND OPERATE A WASTEWATER REUSE SYSTEM LOCATED AT **IDAHO NATIONAL LABORATORY'S (INL) CENTRAL FACILITIES AREA (CFA) SEWAGE TREATMENT PLANT (STP), (TOWNSHIP 2 NORTH, RANGE 30 EAST, SECTION 6 AND TOWNSHIP 2 NORTH, RANGE 29 EAST, SECTION 1)** IN ACCORDANCE WITH THE WASTEWATER REUSE RULES (IDAPA 58.01.17) AND WASTEWATER RULES (IDAPA 58.01.16), THE GROUND WATER QUALITY RULE (IDAPA 58.01.11), AND ACCOMPANYING PERMIT, APPENDICES, AND REFERENCE DOCUMENTS. THIS PERMIT IS EFFECTIVE FROM THE DATE OF SIGNATURE AND EXPIRES ON **March 16, 2015.**

Erick Neher
Idaho Falls Regional Administrator
Idaho Department of Environmental Quality

Date Issued: 3-17-10

IDAHO DEPARTMENT OF ENVIRONMENTAL QUALITY
Idaho Falls Regional Office
900 N. Skyline, Suite B
Idaho Falls, ID 83402
(208) 528-2650

POSTING ON SITE RECOMMENDED

B. Permit Contents, Appendices, and Reference Documents

References

1. Plan of Operation (See Section E, CA-141-01).
2. Waste Solids Management Plan for the Central Facilities Area Sewage Treatment Plant, INL/EXT-06-01068, January 2006.
3. Runoff Management Plan for the Central Facilities Area Sewage Treatment Plant Land Application Area, INL/EXT-06-01067, January 2006.

The Sections, Appendices, and Attachments listed on this page are all elements of Wastewater Reuse Permit LA-000141-03 and are enforceable as such. This permit does not relieve the owner, **United States Department of Energy – Idaho Operations (DOE-ID)**, hereafter referred to as the permittee, or the operator, **Battelle Energy Alliance , LLC (BEA)**, from responsibility for compliance with other applicable federal, state or local laws, rules, standards or ordinances.

C. Abbreviations, Definitions

Table 1. Abbreviations and Definitions

Ac-in	Acre-inch. The volume of water or wastewater to cover 1 acre of land to a depth of 1 inch. Equal to 27,154 gallons.
BEA	Battelle Energy Alliance, LLC
BMP or BMPs	Best Management Practices
CFA	Central Facilities Area
COD	Chemical Oxygen Demand
DEQ or the Department	Idaho Department of Environmental Quality
Director	Director of the Idaho Department of Environmental Quality, or the Directors Designee, i.e. Regional Administrator
GS	Growing Season – Typically April 01 through October 31 (214 days)
GWQR	IDAPA 58.01.11 "Ground Water Quality Rule"
HLRgs	Growing Season Hydraulic Loading Rate. Includes any combination of wastewater and supplemental irrigation water applied to land application hydraulic management units during the growing season. The HLRgs limit is specified in Section F. *Standard Permit Limits and Conditions.*
HLRngs	Non-Growing Season Hydraulic Loading Rate. Includes any combination of wastewater and supplemental irrigation water applied to each hydraulic management unit during the non-growing season. The HLRngs limit is specified in Section F. *Standard Permit Limits and Conditions.*
HMU	Hydraulic Management Unit (Serial Number designation is MU)
IDAPA	Idaho Administrative Procedures Act.
INL	Idaho National Laboratory
LG	Lagoon
lb/ac-day	Pounds (of constituent) per acre per day
MG	Million Gallons (1 MG = 36.827 acre-inches)
MGA	Million Gallons Annually (per WLAP Reporting Year)
NGS	Non-Growing Season – Typically November 01 through March 31 (151 days)
O&M manual	Operation and Maintenance Manual, also referred to as the Plan of Operation
SAR	Sodium Absorption Ratio
SI	Supplemental Irrigation water applied to the land application treatment site.
SMU	Soil Monitoring Unit (Serial Number designation is SU)
STP	Sewage Treatment Plant
TDS	Total Dissolved Solids or Total Filterable Residue
USDOE	United States Department of Energy
USGS	United States Geological Survey
WW	Wastewater applied to the land application treatment site

D. Facility Information

Table 2. Specific Facility Information

Legal Name of Permittee	United States Department of Energy – Idaho Operations Office (DOE-ID) and Battelle Energy Alliance, LLC (BEA)
Type of Wastewater	Municipal and Industrial
Method of Treatment	Aerobic lagoon, facultative lagoon, slow-rate land application
Type of Facility	Federal (USDOE) Facility located at the Idaho National Laboratory (INL). This treatment system is associated with the INL Central Facilities Area (CFA).
Facility Location	The Central Facility Area of INL is located approximately 52 miles west of Idaho Falls, ID.
Legal Location	T2N, R29E, Section 1 and T2N, R30E, Section 6
County	Butte
USGS Quad	North of Scoville, ID (formerly Circular Butte 3 SW)
Soils on Site	Silty clay loam
Depth to Ground Water	The depth to the regional aquifer (Snake River Plain aquifer) is approximately 500 feet.
Beneficial Uses of Ground Water	Agricultural, industrial, domestic
Nearest Surface Water	Big Lost River, 3.8-miles northwest
Beneficial Uses of Surface Water	Irrigation
Responsible Officials Mailing Address Phone / Fax	Raymond V. Furstenau, Deputy Manager U.S. Department of Energy – Idaho Operations Office Mail Stop 1203 1955 Fremont Avenue Idaho Falls, Idaho 83401-1203 Tel: (208) 526-0193 Fax: (208) 526-0982 Dwayne E. Coburn, Director, Facility and Site Services Battelle Energy Alliance Mail Stop 3406 1955 Fremont Avenue Idaho Falls, Idaho 83415-3406 Tel: (208) 526-8688 Fax: (208) 526-4451

D. Facility Information

Facility Contacts **Mailing Address** **Phone / Fax**	Richard Kauffman, Environmental Technical Support U.S. Department of Energy – Idaho Operations Office Mail Stop 1216 1955 Fremont Avenue Idaho Falls, Idaho 83401-1216 Tel: (208) 526-7177 Fax: (208) 526-1926 Jo Anna Stenzel, Director, Environmental Support and Services Battelle Energy Alliance, LLC Mail Stop 3405 1955 Fremont Avenue Idaho Falls, Idaho 83415-3405 Tel: (208) 526-8496 Fax: (208) 526-3149
Additional Facility Information	The Department of Energy is a federal agency of the Executive Branch. By applying for, and accepting this WLAP, USDOE reserves and does not waive any rights, authority, claim or defenses, including both sovereign immunity and federal preemption under the Atomic Energy Act (AEA), that it may have or wish to pursue in any administrative, judicial or other proceeding. USDOE Asserts, with respect to AEA radioactive materials, that it is a self-regulating entity under the AEA. As such, the approval granted by DEQ to the permittee to land apply wastewater, as contained in this permit, does not authorize the application or disposal of AEA radioactive materials that may occur during the wastewater land application activities authorized by this permit.

E. Compliance Schedule for Required Activities

The Activities in the following table sh all be completed on or before the Co mpletion Date unless modified by the Department in writing.

Table 3. Compliance Activities

Compliance Activity Number Completion Date	Compliance Activity Description
CA-141-01 **Within 12 months of permit issuance**	A final Plan of Operation (O&M Manual) for the wastewater reuse facility, incorporating the requirements of this permit shall be submitted to the Department for review and approval. The Plan shall include a description of approved sample collection methods, appropriate analytical methods and companion QA/QC protocol. The manual may reference other written procedures required for the operation and maintenance of the wastewater reuse facility.
CA-141-02 **May 31, 2014**	Submit a Seepage Testing Procedure to DEQ for review and approval for the three wastewater treatment lagoons. The Procedure shall describe the testing procedures, equipment, measurement methods, and calculation methodology conclusions for DEQ review and approval.
CA-141-03 **August 31, 2014**	Upon DEQ approval of the Seepage Testing Procedure (CA-141-02, above), the permittee shall complete seepage testing of CFA STP lagoons 1 through 3 and submit a Seepage Test Results Report to DEQ no later than August 31, 2015 for review and approval.

F. Permit Limits and Conditions

The Permittee is allowed to apply wastewater and treat it on a land application site as prescribed in the tables below and in accordance with all other applicable permit conditions and schedules.

Table 4. Permit Limits and Conditions

Category	Permitted Limits and Conditions
Type of Wastewater	Class E Municipal and Industrial Wastewater
Application Site Area	73.5 acres
Application Season	April 1 through October 31. Land Application during the Non-Growing Season is not allowed.
Growing Season (GS)	GS – April 1 through October 31 (214 days).
Non-Growing Season (NGS)	NGS – November 1 through March 31 (151 days).
Reporting Year for Annual Loading Rates	November 1 through October 31.
Maximum Hydraulic Loading Rate, Growing Season (wastewater only)	**37.00 Million Gallons** (MG) may be applied on the 73.5 acre HMU, and shall not exceed **18.5 inches/acre**. Wastewater shall be applied as evenly as practicable to the entire land application site.
Supplemental Irrigation	Application of supplemental (fresh) irrigation water is prohibited.
Disinfection	Not Required
Runoff	Runoff shall be managed in accordance with the most recent Runoff Management Plan approved by DEQ.
Ground Water Quality	As a result of the operation of the wastewater land treatment system authorized by this permit, the permittee shall be in compliance with the Ground Water Quality Rule (GWQR), IDAPA 58.01.11.
Grazing	Grazing of domesticated animals within the land application site is prohibited.
Allowable crops	Cultivation of crops grown for human consumption is prohibited.

F. Permit Limits and Conditions

Category	Permitted Limits and Conditions
Fencing and Posting	Fencing is not required. Posting shall state "Sewage Effluent Application – Keep Out", or equivalent. Posting required every 500 feet and at each corner of the outer perimeter of the buffer zone(s) at the site. Posting shall be visible and legible from outside of the wastewater application perimeter.
Buffer Zones	The CFA STP effluent is not disinfected. Therefore, the following minimum buffer zone distances shall be provided between land application areas and the following items: Domestic Water Wells: 500 ft. Public Water Wells: 1000 ft Surface Water: 100 ft Public Access Areas: 1000 ft
Construction Plans	Prior to construction or modification of all wastewater facilities associated with the land application system or expansion, detailed plans and specifications shall be reviewed and approved by DEQ. Within 30 days of completion of construction, the permittee shall submit as-built plans to DEQ or submit a certification letter stating that all construction was done in substantial compliance with the DEQ approved plans and specifications.

G. Monitoring Requirements

1) Appropriate analytical methods, as given in 40 CFR 136, 40 CFR 141, 40 CFR 143, or as approved by the Idaho Department of Environmental Quality, shall be employed. A description of approved sample collection methods, appropriate analytical methods and companion QA/QC protocol shall be included in the Plan of Operation (See Section E, CA-141-01).

2) The permittee shall monitor and measure parameters as stated in the Facility Monitoring Table in this section.

3) Samples shall be collected at times and locations that represent typical environmental and process parameters being monitored.

4) Unless otherwise specified in this permit, influent and effluent wastewater samples shall be 24 hour flow-proportioned samples of at least 8 aliquots collected either manually or automatically in a manner that yields a representative sample. When effluent flow periods are less than 24 hours, an appropriate number of flow-proportioned aliquot samples shall be collected to yield a representative sample. The number of samples necessary for adequate sampling shall be described in the Plan of Operation (See Section E, CA-141-01).

5) If the soil management unit is less than 15 acres, use 5 sample locations. If the soil management unit is greater than 15 acres, use 10 sample locations. All soil sample collection locations shall be randomly identified within the soil management unit.

6) Three (3) soil samples shall be collected at each sample location, one at 0-12 inches, one at 12-24 inches, and one at 24-36 inches, or refusal. The soil samples collected at 0-12 inches from each sample location shall be composited. Similarly, all soil samples collected at 12-24 inches shall be composited and all soil samples collected at 24-36 inches shall be composited. This method will yield three samples for analysis, one for 0-12 inches, one for 12-24 inches and one for 24-36 inches.

7) Reporting of monitoring requirements is described in Section H, Standard Reporting Requirements.

8) Monitoring locations are defined in Appendix 1, "Environmental Monitoring Serial Numbers".

Table 5. Facility Monitoring

Frequency	Monitoring Point	Description and Type of Monitoring	Parameters
Daily (when land applying)	Discharge Point of Wastewater effluent to Land Application (Flow Meter)	Volume of Wastewater Land Applied	Gallons per Day (gpd)
Monthly (when land applying)	Effluent to Land Application	Grab sample	pH, Total Coliform (CFU/100ml)

G. Monitoring Requirements

Frequency	Monitoring Point	Description and Type of Monitoring	Parameters
Monthly (when land applying)	Effluent to Land Application	24-hour composite sample	Total Kjeldahl Nitrogen, Nitrate + Nitrite - Nitrogen, Chemical Oxygen Demand, Total Dissolved Solids, Total Phosphorus
Monthly	HMU	Calculation – Wastewater Hydraulic Loading. Compile Monthly and Annual Totals for Annual Report.	Volume to HMU (MG and in/ac)
Monthly	HMU	Calculation – Wastewater Constituent Loading per acre. Compile Monthly and Annual Totals for Annual Report.	Total Nitrogen, Total Phosphorus, Chemical Oxygen Demand, Total Dissolved Solids (lb/ac)
October 2010 and October 2013	SMU	Soil Composites as specified in Section G, No. 6.	Ammonium-Nitrogen, Nitrate-Nitrogen, Electrical Conductivity, Sodium Absorption Ratio, pH, %Organic Matter, plant available phosphorus (Olsen Method)

H. Standard Reporting Requirements

1.) The Permittee shall submit an Annual Wastewater-Land Application Site Performance Report ("Annual Report") prepared by a competent environmental professional no later than **March 1st** of each year, which shall cover the previous reporting year from November 1 through October 31. The Annual Report shall include an interpretive discussion of monitoring data (soils, hydraulic loading, wastewater etc.) with particular respect to environmental impacts by the facility.

2.) The annual report shall contain the results of the required monitoring as described in *Section G. Monitoring Requirements*. The permittee shall summarize and submit all monitoring data generated by the facility as specified in *Section G* to the Department with the annual report. If the permittee monitors any parameter for compliance purposes more frequently than required by this permit, the results of the additional compliance monitoring shall be included in this summary and submitted in the annual report. Data collected in support of the daily operation of the treatment system shall not be included.

3.) The annual report shall contain a discussion of all noncompliance events, reported under Section I.7 of this permit, which occurred during the WLAP reporting year. The discussion shall include the cause of each noncompliance, the corrective actions implemented to reduce or eliminate each noncompliance, and whether or not each noncompliance has been corrected. For the noncompliance events that have not been corrected, the annual report shall present further corrective actions that will be implemented to reduce or eliminate the noncompliance, including an implementation plan and schedule for the corrective actions and an expected time period when the facility expects to return to compliance.

4.) One copy of the annual report shall be submitted to the Engineering Manager at the Idaho Falls Regional DEQ Office.

Greg Eager, P.E.
Idaho Falls Regional Office
900 N. Skyline, Suite B
Idaho Falls, ID 83402
208-528-2650

5.) Notice of completion of any work described in *Section E. Compliance Schedule for Required Activities* shall be submitted to the Department within 30 days of activity completion. The status of all other work described in Section E shall be submitted with the Annual Report.

I. Standard Permit Conditions: Procedures and Reporting

1. The permittee shall at all times properly maintain and operate all structures, systems, and equipment for treatment, operational controls and monitoring, which are installed or used by the permittee to comply with all conditions of the permit or the Wastewater Reuse Rules, in conformance with a DEQ approved, current Plan of Operations (Operations and Maintenance Manual) which describes in detail the operation, maintenance, and management of the wastewater treatment system. This Plan of Operations shall be updated as necessary to reflect current operations.

2. Wastewater(s) or recharge waters applied to the land surface must be restricted to the premises of the application site. Wastewater discharges to surface water that require a permit under the Clean Water Act must be authorized by the U.S. Environmental Protection Agency.

3. Wastewater must not create a public health hazard or nuisance condition as stated in IDAPA 58.01.16.600.03. In order to prevent public health hazards and nuisance conditions the permittee shall:

   a. Apply wastewater as evenly as practicable to the treatment area;
   b. Prevent organic solids (contained in the wastewater) from accumulating on the ground surface to the point where the solids putrefy, or support vectors; and
   c. Prevent wastewater from ponding in the fields to the point where the ponded wastewater putrefies or supports vectors or insects.

4. The permittee shall not hydraulically overload any particular area of the wastewater land application treatment site.

5. All waste solids, including dredgings and sludges, shall be utilized or disposed in a manner which prevents their entry, or the entry of contaminated drainage or leachate therefrom, into state waters such that health hazards and nuisance conditions are not created; and to prevent impacts on designated beneficial uses of the ground water and surface water. If waste solids are generated by the permittee, a Waste Solids Management Plan shall be submitted to the Department for review and approval. The permittee's management of waste solids shall be governed by the terms of the DEQ approved Waste Solids Management Plan, which upon approval shall be an enforceable portion of this permit.

6. If the permittee intends to continue operation of the permitted facility after the expiration of an existing permit, the permittee shall apply for a new permit at least six months prior to the expiration date of the existing permit in accordance with the Wastewater Reuse Rules and include recent (within 12 months) seepage tests on all lagoons per latest DEQ procedures (See Section E, CA-141-02 and CA-141-03).

7. The permittee shall allow the Director of the Idaho Department of Environmental Quality or the Director's designee (hereinafter referred to as Director), consistent with Title 39, Chapter 1, Idaho Code, to:

   a. Enter the permitted facility,
   b. Inspect any records that must be kept under the conditions of the permit.
   c. Inspect any facility, equipment, practice, or operation permitted or required by the permit.
   d. Sample or monitor for the purpose of assuring permit compliance, any substance or any parameter at the facility.

8. The permittee shall report to the Director under the circumstances and in the manner specified in this section:

   a. In writing thirty (30) days before any planned physical alteration or addition to the permitted facility or activity if that alteration or addition would result in any significant change in information that was submitted during the permit application process.

b. In writing thirty (30) days before any anticipated change which would result in non-compliance with any permit condition or these regulations.
c. Orally within twenty-four (24) hours from the time the permittee became aware of any non-compliance which may endanger the public health or the environment at telephone numbers provided in the permit by the Director (see below)

DEQ Regional Office: see Permit Certification Page
Emergency 24 Hour Number 1-800-632-8000

d. In writing as soon as possible but within sixty (60) days of the date the permittee knows or should know of any non-compliance unless extended by the DEQ. This report shall contain:

i. A description of the non-compliance and its cause;
ii. The period of non-compliance including to the extent possible, times and dates and, if the non-compliance has not been corrected, the anticipated time it is expected to continue; and
iii. Steps taken or planned to reduce or eliminate reoccurrence of the non-compliance.

e. In writing as soon as possible after the permittee becomes aware of relevant facts not submitted or incorrect information submitted, in a permit application or any report to the Director. Those facts or the correct information shall be included as a part of this report.

9. The permittee shall take all necessary actions to prevent or eliminate any adverse impact on the public health or the environment resulting from permit noncompliance.

10. The permittee shall determine (on an on-going basis) if any noxious weed problems relate to the permitted sites. Noxious weeds shall be controlled in accordance with Idaho Code Title 22, Chapter 24. Also address these control operations in an update to the Plan of Operation.

J. Standard Permit Conditions: Modifications, Violations, and Revocations

1. The permittee shall furnish to the Director within reasonable time, any information including copies of records, which may be requested by the Director to determine whether cause exists for modifying, revoking, re-issuing, or terminating the permit, or to determine compliance with the permit or these regulations.

2. Both minor and major modifications may be made to this permit as stated in IDAPA 58.01.17.700.01 and 02 with respect to any conditions stated in this permit upon review and approval of the DEQ.

3. Whenever a facility expansion, production increase or process modification is anticipated which will result in a change in the character of pollutants to be discharged or which will result in a new or increased discharge that will exceed the conditions of this permit, or if it is determined by the DEQ that the terms or conditions of the permit must be modified in order to adequately protect the public health or environment, a request for either major or minor modifications must be submitted together with the reports as described in H. *Standard Reporting Requirements*, and plans and specifications for the proposed changes. No such facility expansion, production increase or process modification shall be made until plans have been reviewed and approved by the DEQ and a new permit or permit modification has been issued.

4. Permits shall be transferable to a new owner or operator provided that the permittee notifies the Director by requesting a minor modification of the permit before the date of transfer.

5. Any person violating any provision of the Wastewater Reuse Rules, or any permit or order issued thereunder shall be liable for a civil penalty not to exceed ten thousand dollars ($10,000) or one thousand dollars ($1,000) for each day of a continuing violation, whichever is greater. In addition, pursuant to Title 39, Chapter 1, Idaho Code, any willful or negligent violation may constitute a misdemeanor.

6. The Director may revoke a permit if the permittee violates any permit condition or the Wastewater Reuse Rules.

7. Except in cases of emergency, the Director shall issue a written notice of intent to revoke to the permittee prior to final revocation. Revocation shall become final within thirty-five (35) days of receipt of the notice by the permittee, unless within that time the permittee requests an administrative hearing in writing to the Board of the Department of Environmental Quality pursuant to the Rules of Administrative Procedures contained in IDAPA 58.01.23.

8. If, pursuant to Idaho Code Section 67-5247, the Director finds the public health, safety or welfare requires emergency action, the Director shall incorporate findings in support of such action in a written notice of emergency revocation issued to the permittee. Emergency revocation shall be effective upon receipt by the permittee. Thereafter, if requested by the permittee in writing, a revocation hearing before the Board of the Department of Environmental Quality shall be provided. Such hearings shall be conducted in accordance with the Rules of Administrative Procedures contained in IDAPA 58.01.23.

9. The provisions of this permit are severable and if a provision or its application is declared invalid or unenforceable for any reason, that declaration will not affect the validity or enforceability of the remaining provisions.

10) The permittee shall notify the DEQ at least six (6) months prior to permanently removing any permitted land application facility from service, including any treatment, storage, or other facilities or equipment associated with the land application site. Prior to commencing closure activities, the permittee shall:

    a) participate in a pre-site closure meeting with the DEQ;
    b) develop a site closure plan that identifies specific closure, site characterization, or cleanup tasks with scheduled task completion dates in accordance with agreements made at the pre-site closure meeting; and
    c) submit the completed site closure plan to the DEQ for review and approval within forty-five (45) days of the pre-site closure meeting. The permittee must complete the DEQ approved site closure plan.

Appendix 1
Environmental Monitoring Serial Numbers

Table 6. HYDRAULIC MANAGEMENT UNITS

Serial Number	Description	Acres
MU-014101	Land Application Site	73.5

Table 7. WASTEWATER SAMPLING POINTS

Serial Number	Description
WW-014102	Grab sample and 24-hour composite sample of effluent discharge to land application site, but not after the pump well.

Table 8. SOIL MONITORING UNITS

Serial Number	Description	Associated MU
SU-014101	Land Application Site, 73.5 acres	MU-014101

Table 9. LAGOONS

Serial Number	Description
LG-014101	Lagoon no. 1; Aeration lagoon
LG-014102	Lagoon no. 2; Facultative lagoon
LG-014103	Lagoon no. 3; Polishing lagoon

Appendix 2
Site Maps

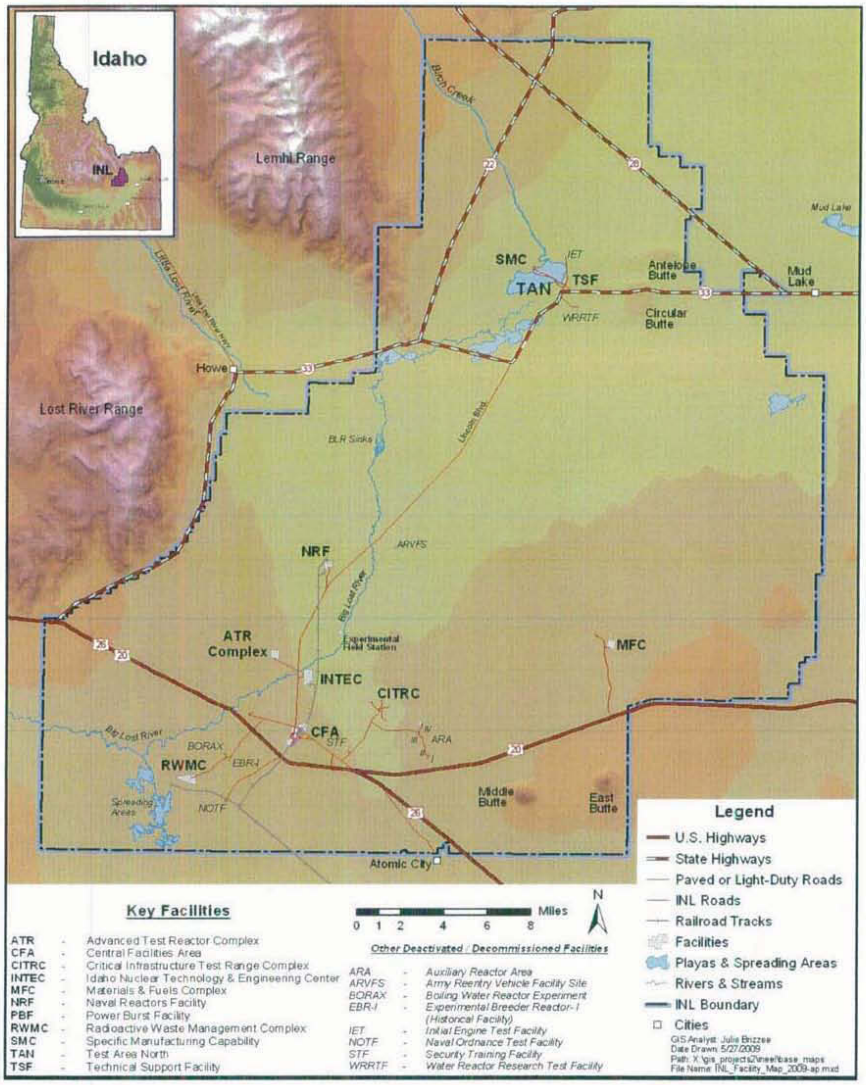

Figure 1. Idaho National Laboratory major facility areas.

Appendix 2
Site Maps

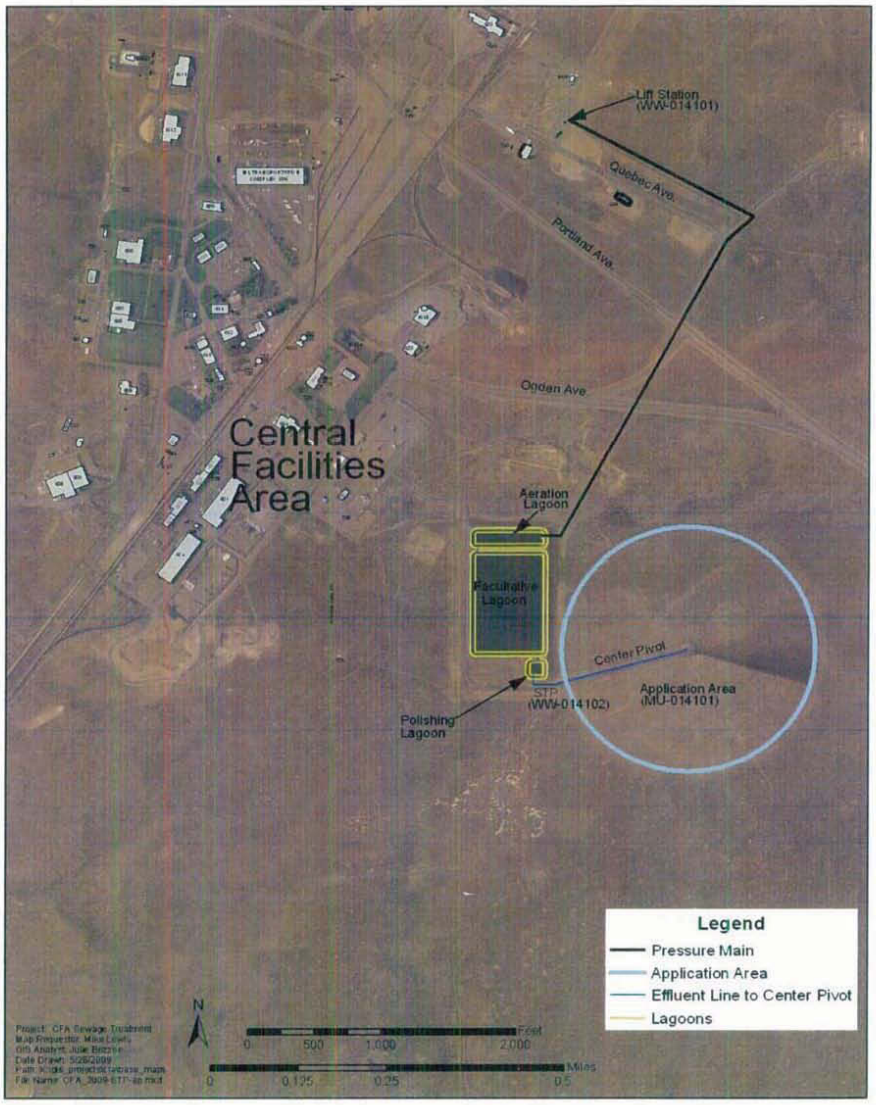

Figure 2. CFA STP monitoring locations, lagoons and land application site.

Appendix 2
Site Maps

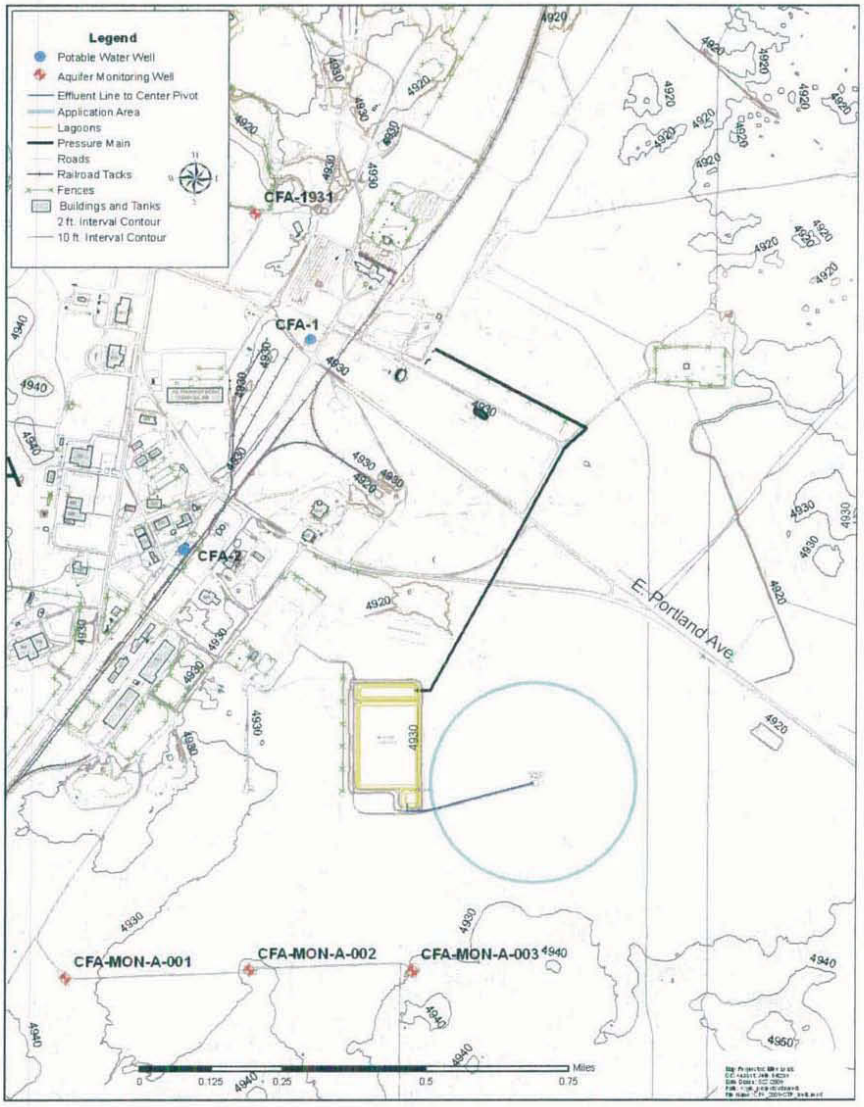

Figure 3. Locations of monitoring and potable productions wells near the CFA STP.

Appendix 2
Site Maps

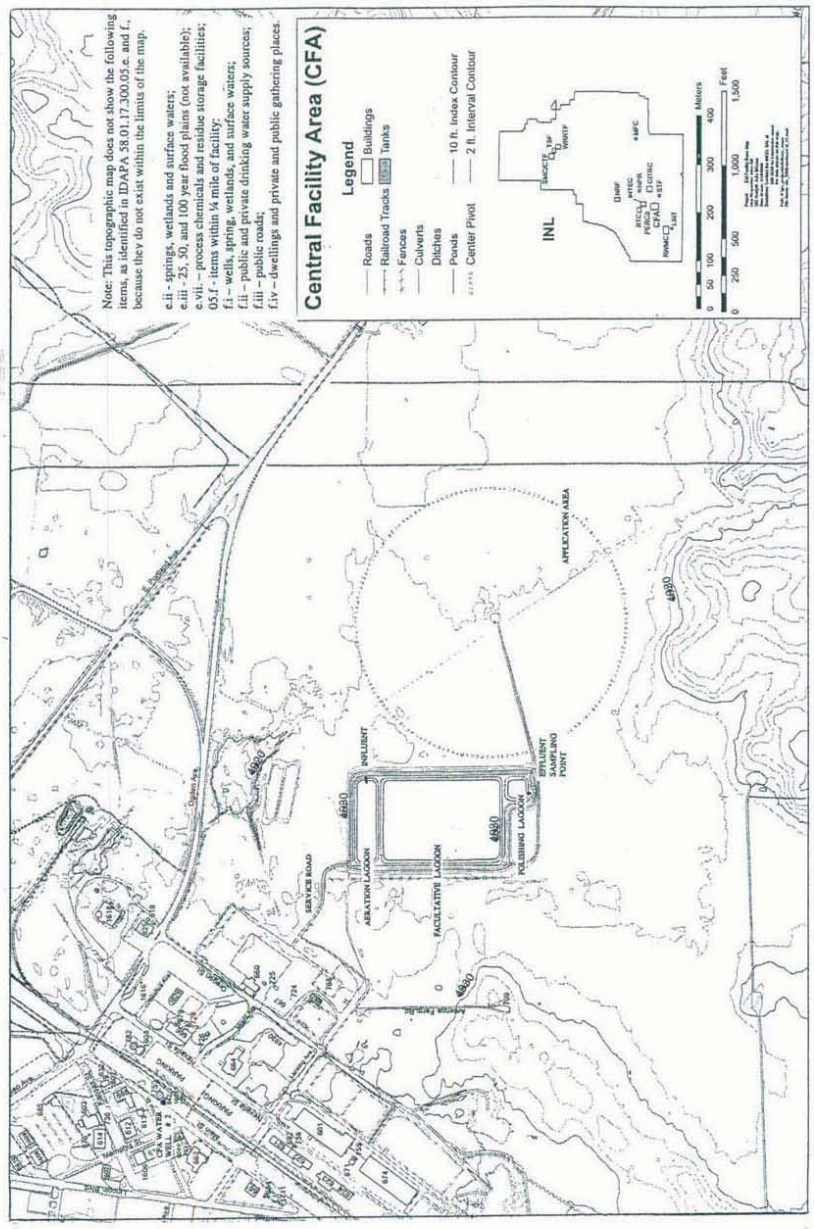

Figure 4. CFA STP Topography.

Appendix 2
Site Maps

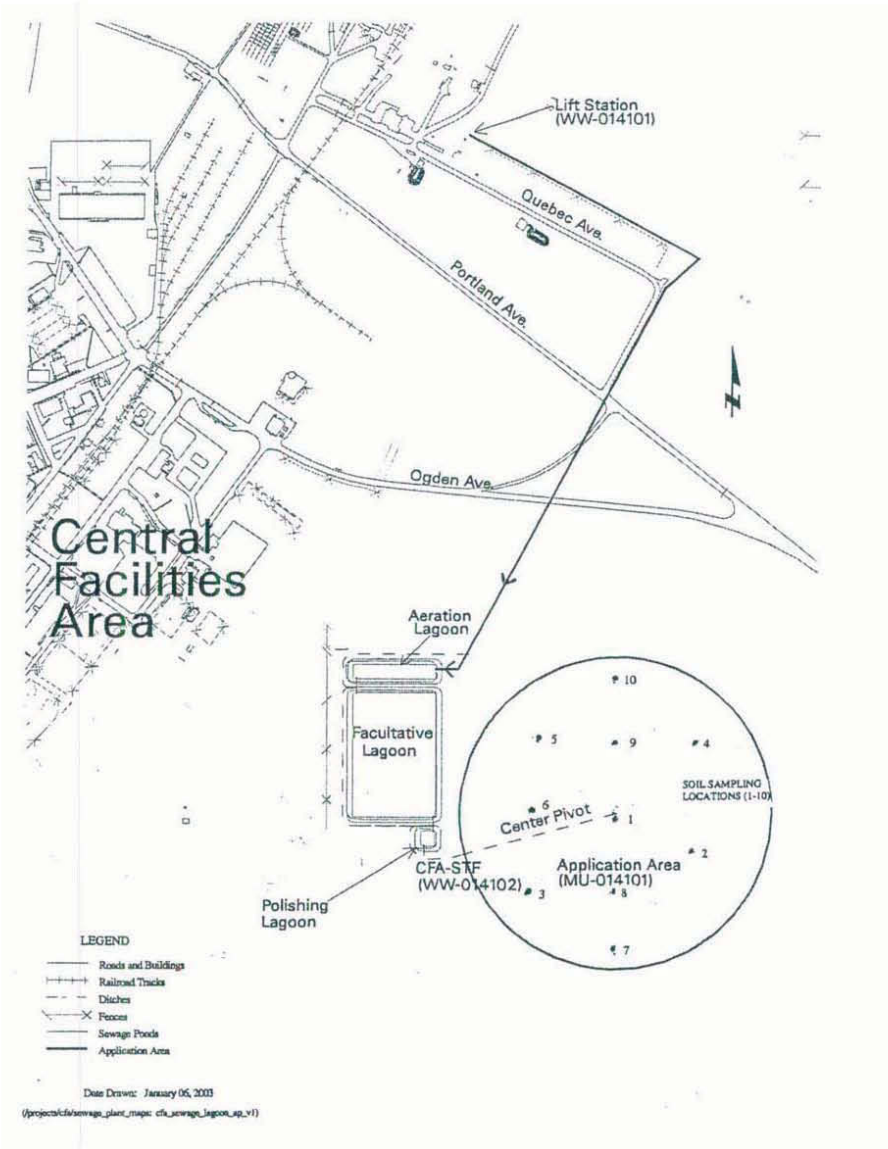

Figure 5. CFA wastewater and soil sampling locations.

Appendix B

Lagoon Operator Maintenance Guide

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HOW TO CONTROL WATER WEEDS

Indications/observations	Probable Cause	Solutions
Weeds along lagoon edges provide food for burrowing animals, cause short-circuiting problems, stop wave action so that scum can collect, and make a home for mosquitoes. Odors develop in the still weed – infested areas. Excessive aquatic weeds can limit sunlight penetration and prevent wind action, thus reducing the oxygen in the lagoon. Root penetration could causes leak in lagoon liners.	Poor circulation, maintenance, insufficient water depth.	Pull weeds by hand if new growth. Mow weeds with a sickle bar mower. Lower water level to expose weeds, then burn with gas burner. Allow the surface to freeze at a low water level, raise the water level, and the floating ice will pull the weeds as it rises. (Large clumps of roots will leave holes in lagoon bottom; best results are obtained when weeds are young.) Increase water depth to above tops of weeds. Use riprap. Caution: If weeds get started in the riprap, they will be difficult to remove but can be sprayed with acceptable herbicides. To control floating weeds, use rakes or push a board with a boat, then physically remove weeds from lagoon.

HOW TO OBTAIN BEST ALGAE REMOVAL IN THE EFFLUENT

Indications/observations	Probable Cause	Solutions
Most of the suspended solids present in a lagoon effluent are due to algae. Because many single-celled algae are motile and are also very small, they are difficult to remove.	Weather or temperature conditions that favor particular population of algae.	Draw off effluent from below the surface by use of the transfer structures. In some cases, alum dosages of 20 mg/L has been used in final cells used for intermittent discharge to improve effluent quality. Dosages at or below this level are not toxic.

HOW TO CORRECT LIGHTLY LOADED LAGOONS

Indications/observations	Probable Cause	Solutions
Lightly loaded lagoons may produce filamentous algae and moss, which limits sunlight penetration. Algae can also tend to clog lagoon outlets.	Low seasonal flow.	Correct by increasing the loading by reducing the number of cells in use.

HOW TO CORRECT A LOW DISSOLVED OXYGEN (DO)

Indications/observations	Probable Cause	Solutions
A low, continued downward trend in DO indicates possible impending anaerobic conditions and the cause of unpleasant odors. Treatment becomes less efficient.	Poor light penetration, low detention time, high BOD loading, or toxic industrial wastes. (Daytime DO should not drop below 3.0 mg/L during warm months.)	Remove floating/emergent weeds if covering greater than 40% of the lagoon. Add supplemental aeration (surface aerators, diffusers, and daily operation of a motor boat). Add recirculation by using a portable pump to return final effluent to the head works. Determine if overload is due to industrial source and remove it.

HOW TO CORRECT OVERLOADING

Indications/observations	Probable Cause	Solutions
Overloading that results in incomplete treatment of the waste. Overloading problems can be detected by offensive odors and/or a yellow green or gray color. Lab tests showing low pH, DO, and excessive BOD loading per unit area should also be considered.	Short-circuiting, industrial waste, infiltration, and weather conditions.	Bypass the cell and let it rest. Recirculate lagoon effluent. Look at possible short-circuiting. Install supplementary aeration equipment.

HOW TO CORRECT A DECREASING TREND IN pH

Indications/observations	Probable Cause	Solutions
Low pH. pH controls the environment for algae types; as an example, the green chlorella needs a pH of 8.0 to 8.4. pH should be on the alkaline side, preferably about 8.0 to 8.4. Both pH and DO will vary throughout the day, with lowest reading at sunrise and highest reading in late afternoon. Measure pH same time each day and plot on a graph.	A decreasing pH is followed by a drop in DO as the green algae die off. This is most often caused by overloading, long periods of adverse weather, or higher animals such as daphnia feeding on the algae.	Bypass the cell and let it rest. Recirculate the lagoon effluent. Check for possible short-circuiting. Install supplementary aeration equipment if problem is persistent and due to overloading. Look for possible toxic or external causes of algae die-off and correct at source.

HOW TO CORRECT SHORT-CIRCUTTING

Indications/observations	Probable Cause	Solutions
Odor problems, low DO in parts of the lagoon, anaerobic conditions, and low pH. After recording the DO and pH readings for several locations, the areas that are not receiving good circulation become evident. These areas are characterized by a low DO and pH.	Poor wind action or poor arrangement of inlet and outlet locations. May also be due to shape of lagoon, weed growth, or irregular bottom.	Install baffling around inlet location to improve distribution. Add recirculation to improve mixing. Adjust or expand aerator arrangement.

HOW TO CORRECT ANAEROBIC CONDITIONS

Indications/observations	Probable Cause	Solutions
Facultative lagoon that turned anaerobic resulting in high BOD, suspended solids, and scum in the effluent in continuous discharge lagoons. Unpleasant odors, the presence of filamentous bacteria and yellowish-green or gray color, and placid surface indicate anaerobic conditions.	Overloading, short-circuiting, poor operation, or toxic discharges.	Add supplemental aeration to Lagoons 2 or 3. Change inlets and outlets to eliminate short-circuiting. See How to Correct Short-Circuiting. Add recirculation (temporary-use portable pumps) to provide oxygen and mixing. Eliminate sources of toxic discharges.

HOW TO CORRECT A HIGH BOD IN THE EFFLUENT

Indications/observations	Probable Cause	Solutions
Visible dead algae.	Short detention times, high organic or hydraulic loads, and possible toxic compounds.	Check for collection system infiltration and eliminate at source. Use portable pump to recirculate the water. Add new inlet and outlet locations. Reduce loads due to industrial sources if above design level. Prevent toxic discharges.

HOW TO CORRECT PROBLEMS IN AERATED LAGOONS

Indications/observations	Probable Cause	Solutions
Fluctuating DO, fine pin floc in final cell effluent, frothing and foaming, ice interfering with operation.	Shock loading, over aeration, industrial waste, floating ice.	Control aeration system by using time clock to allow operation during high-load periods, monitor DO to set up schedule for even operation, holding approximately 1 mg/L or more. Vary operation of aeration system to obtain solids that flocculate or "clump" together in a secondary cell, but are not torn apart by excessive aeration.

HOW TO CONTROL ODORS

Indications/observations	Probable Cause	Solutions
Odors are a general nuisance to the public.	The odors are generally the result of overloading, long periods of cloudy weather, poor lagoon circulation, industrial waste, or ice melt.	Install supplementary aeration such as floating aerators, caged aerators, or diffused aeration to provide mixing and oxygen. Daily trips over the lagoon area in a motor boat also help. Note: *Stirring the lagoon may cause odors to be worse for short periods but will reduce total length of odorous period.* Recirculate lagoon effluent to the lagoon influent to provide additional oxygen and to distribute the solids concentration. Recirculate on a 1 to 6 ratio.

		Eliminate septic or high strength industrial waste.

HOW TO CONTROL DIKE VEGETATION

Indications/observations	Probable Cause	Solutions
High weed growth, brush, trees, and other vegetation provide nesting places for animals, can cause weakening of the dike and presents an unsightly appearance, and may reduce wind action on the lagoon.	Poor maintenance.	Periodic mowing is the best method. Sow dikes with a mixture of fescue and blue grasses on the shore and short native grasses elsewhere. It is desirable to select a grass that will form a good cover and drive out tall weeds by binding the soil and "out compete" undesirable growth. Spray with approved weed control chemicals.

HOW TO CONTROL SCUM

Indications/observations	Probable Cause	Solutions
It is necessary to control scum formations to prevent odor problems and to eliminate breeding spots for mosquitoes. Also, sizeable floating rafts will reduce sunlight.	Lagoon bottom is turning over with sludge floating to the surface. Poor circulation and wind action. High amounts of grease and oil in influent will also cause scum.	Use rakes from the shoreline or jets of water from pumps or tank trucks. Broken scum usually sinks. Any remaining scum should be skimmed and disposed of by burial or hauled to landfill with approval of regulatory agency.

Appendix C

List of Suppliers and Contractors

Appendix C

List of Suppliers

Lift Station Pump
Hydromatic
Aurora Pump
800 Airport Road
North Aurora, Illinois 60542
(708) 859-7000

Ball Check Valve
GA Industries, Inc.
9025 Marshall Road
Mars, Pennsylvania 16046
(412) 776-1020

Flange Pipe and Wall Sleeve, Flanged Fittings
Tyler Pipe
P.O. Box 2027
Tyler, Texas 75710
(903) 882-5511

PVC Gasketed Pressure Pipe
Pacific Plastics, Inc.
P.O. Box 399
Beaverton, Oregon 97075
(503) 647-2236

Polyethylene Pipe and Fittings
Plexco/Spirolite Division of Chevron Chemical Co.
1280 Jefferson Lane
Colton, California 92324
(909) 420-5552

Combination Sewage Air Valve
Valmatic
905 Riverside Drive
Elmhurst, Illinois 60126
(708) 941-7600

Vertical Motors
8100 W. Florissant Avenue
P.O. Box 3946
St. Louis, Missouri 63136
(314) 533-2000

Pivot Irrigation System
Valmont Irrigation
Valley, Nebraska 68064-0358
(402) 359-2201

Sewage Flow Meter
TN Technologies, Inc.
P.O. Box 800
Round Rock, Texas 78680-0800
(512) 388-9100

Resilient-Wedge Valve (Gate Valve)
1021 E. Water Street
Elmira, New York 14902-1516
(607) 734-221

Fiberglass Reinforced Polyester Depth Gauge
Plastic-Fab, Inc.
P.O. Box 100
Tualatin, Oregon 97062-0100
(503) 692-5460

Transfer Structure and Outlet Structure
Amcor Precast
P.O. Box 51418
Idaho Falls, Idaho 83405
(208) 522-9701

Canal Gate and Slide Gate
Waterman Industries, Inc.
Exeter, CA 93221
(209) 562-4000

Mixer-Aerator
Air-O-Lator Corporation
8104 Paseo
Kansas City, Missouri 64131
(800) 821-3177

List of Contractors

Golden West Irrigation
4755 Haroldsen Drive
P.O. Box 51096
Idaho Falls, Idaho 83405

Appendix D

CFA STP Wastewater Operations Daily Log Sheet

Appendix D

CFA STP Wastewater Operations Daily Log Sheet

CFA STP WASTEWATER OPERATIONS DAILY LOG SHEET

Date:_____ Operator:_____ Time:_____

		READINGS	PARAMETERS
INFLUENT TO LAGOON 1 – gallons/day (gpd)	Daily		50,000–250,000 gpd
[1] EFFLUENT TO PIVOT (gpd) When Operating Center Pivot	Daily		150,000–600,000 gpd
INFLUENT TO LAGOON 1 DISSOLVED OXYGEN (D.O.)	Weekly		≥0.1 (mg/L)
INFLUENT TO LAGOON 1 pH	Weekly		6–10
INFLUENT TO LAGOON 1 TEMPERATURE (TEMP)	Weekly		0–30 (C°)
EFFLUENT FROM LAGOON 1 D.O.	Weekly		≥2 (mg/L)
EFFLUENT FROM LAGOON 1 pH	Weekly		6–10
EFFLUENT FROM LAGOON 1 TEMPERATURE (TEMP)	Weekly		0–30 (C°)
[2] EFFLUENT FROM LAGOON 2 OR 3 D.O.	Weekly		≥2 (mg/L)
[2] EFFLUENT FROM LAGOON 2 OR 3 pH	Weekly		6–10
[2] EFFLUENT FROM LAGOON 2 OR 3 TEMPERATURE (TEMP)	Weekly		0–30 (C°)

1. Effluent to pivot reading may be taken from April 1 through October 31.
2. April 1 through October 31, effluent from Lagoon 3 will be used for testing.

REMARKS AND/OR OBSERVATIONS:

CFA STP Responsible or Substitute Charge Operator Review:

_____ DATE:_____