COLE M. RIVERS FISH HATCHERY MODIFIED OPERATIONAL CONDITION ASSESSMENT

6-8 February, 2019

OVERVIEW

1. Project Background and Description

Cole M. Rivers Hatchery was constructed by the US Army Corps of Engineers (USACE) in 1973 to mitigate for spawning and rearing areas blocked by the construction of Lost Creek, Applegate, and Elk Creek Dams. The facility is used for adult collection, spawning, egg incubation and rearing of Chinook salmon, coho salmon, steelhead, and egg incubation and rearing of rainbow trout.

The facility is owned by the USACE but operation and maintenance of the facility has been contracted to the Oregon Department of Fish and Wildlife (ODFW) to produce and release fish to meet USACE mitigation goals.

The purpose of this modified operational condition assessment (OCA) was to determine condition of the equipment/infrastructure in use at the facility as a way to qualify the risk of our ability to meet this mission. Critical equipment in substandard condition puts mission success at risk.

2. Project Scope

The scope of the site visit centered on two primary areas: providing easily consumable condition information regarding the current condition of the equipment and infrastructure at the facility and providing a list of recommended maintenance activities, new designs, equipment replacements, and/or critical spares that should be considered to ensure the facility can meet mission requirements. The recommended maintenance and/or testing activities are divided up into immediate maintenance/testing activities designed to help determine/improve current condition and preventative maintenance activities that should be performed at the recommended frequency.

For the assessment, the site was broken up into the following significant features: hatchery building (i.e. hatch house), garage and shop building, electrical and mechanical building (i.e. water treatment area/building), spawning building, pre-sort pool/collection ponds, brood collection holding ponds, fish ladder, outside starter ponds, rearing ponds (raceways), water supply intake, drainage system, domestic water and sewage and lift stations, electrical system, and pavement/parking areas.

3. High-Level Requirements

For each of the significant features identified above, the OCA team has provided a very short narrative that includes a basic description of the feature and their professional opinion regarding the current operational condition of the feature. Individual asset conditions are provided in the OCA spreadsheet so only a broad condition overview is provided here. Additionally provided for each feature above is a table of immediate regular maintenance or testing activities and a table of recommended preventative maintenance activities performed at the frequency shown in tables.

4. Features

a. Hatchery Building/Hatch House

Basic Description:

Offices, break room, visitor area, rest rooms, egg incubation area.

General Condition Description:

The Hatch House is in generally good condition, represented by the “B” ratings applied to most assets. The building is original and showing expected signs of aging, including a roof with minor leaking, insufficient electrical receptacles for modern equipment needs, and outdated/hard to source HVAC components.

The egg incubation area is a major feature of this building, and has a compromised water supply evidenced by several water quality tests that have detected the presence of pathogens and other contaminants (e.g. diatoms). These concerns are further detailed in the Electrical and Mechanical Building (Water Treatment Area) section of this report.

The interior lighting in the egg incubation area has negative impacts due to color temperature, placement, and a lack of on/off ramping controls. These deficiencies are added stressors to the fish.

Major Concerns:

- 12” Fish Water Supply Pipe

Minor Concerns:

- Interior Lighting (biological impact)
- Roof Leaks

General Recommendations:

Recommended Immediate Maintenance or Testing:

System	Asset	Maintenance/Testing Activity Description	Notes
Water Supply	12” Supply Pipe	Confirm the source of the bacterial and other (e.g. diatoms) contamination by sampling and testing. If contamination source is confirmed to be in the 12” steel water supply pipe, a new design project should be initiated to replace this with new pipe.	ODFW has performed testing to narrow down the location of the contamination to this general location.
Building Structure	Roof	Fix existing leaks	ODFW already addresses this as the need arises.

Recommended Regular Maintenance, Testing, or Activity:

System	Asset	Maintenance/Testing Activity Description	Frequency
Building Structure	Roof	Roof Replacement	20 Years
Lighting	-	Redesign and replacement of lighting system in egg incubation room	n/a

b. Garage and Shop Building

Basic Description:

Concrete walls, flat roof, 6 maintenance bays, used for maintenance machinery and spare parts/equipment storage.

General Condition Description:

There are no major concerns with this asset.

c. Electrical and Mechanical Building (Water Treatment Area)

Basic Description:

Concrete structure, flat roof. This building contains the emergency generator, fish water supply pumps, heaters, UV sterilizers, and main power distribution center. The water treatment system components outside of this building include the sand filtration system, micro-screen filtration system, chillers, and aeration tower.

General Condition Description:

These systems have been heavily modified since original construction. The reuse/recycling water feature has been abandoned. Three UV sterilizer units, the sand filtration system, and the micro-screen filtration system have all been added after original construction. The aeration tower is not currently in use due to concerns with bacterial and diatom contamination observed in December of 2018. In March of 2019, diatom contamination into incubation building was observed.

Major Concerns:

- Aeration Tower
- 12” Supply Pipe
- Chillers (Environmental Hazard)
- Overall Configuration

The assessment team had significant concerns with this area of the project. The water treatment system has been modified in several different evolutions since initial design and construction. The resultant system is overly complicated and has observable deficiencies. The primary concern is that the UV water treatment system does not occur in the final phase of water distribution to ensure clean water to the hatch house. The current configuration does not allow for this. Additionally, the sand filters have a backwash only. There is no

wash feature after the backwash process. Thus, filtered debris may enter the lines when switching from backwash to filter if there is no wash feature. Especially, if the time of backwash is too short.

The main steel 12” water supply header that provides distribution water throughout the facility is a, likely, main contributor to the bacteria and diatoms in the water. Sections of the steel pipe have been replaced in the past. Interior photos of the replaced pipe section shows a rough pipe with significant corrosion. A rough, corroded pipe provides pockets that can trap bacteria. ODFW has tried several times to disinfect this pipe, but efforts have been unsuccessful to date.

Critical Recommendation:

ODFW has provided a sketch recommendation for piping that could be implemented to bypass areas of likely contamination. The sketched recommendation is an interim solution to fix the immediate problem, not a permanent one. The sketch appears to utilize easily acquired materials and simplified assembly to provide an interim fix to the problem. This should be evaluated by the OCA Technical team and immediately implemented if it appears to solve the problem (evaluated and is in progress as of 18 March 2019).

As the above is only a temporary solution, the assessment team recommends a redesign of the water treatment system to include: better screening prior to the pumps, sand filters with wash feature, new pumps, boiler/chiller, UV system, sampling ports, and temperature monitoring.

General Recommendations:

Recommended Immediate Actions:

System	Asset	Maintenance/Testing Activity Description	Notes
Water supply/treatment	Aeration Tower	Bypass piping around tower, and mitigate lost use of tower (used for head and degassing)	ODFW has performed testing to narrow down the location of the contamination to this general location. This is a critical area that needs addressing for the facility to meet mission requirements.
Water supply/treatment	12" Steel Supply Pipe (from Aeration Tower to Egg Incubation Area)	Immediately evaluate and implement ODFW's recommended temporary solution (in progress as of 18 March 2019)	ODFW has provided a piping design that needs evaluation for feasibility and constructability (in progress as of 18 March 2019).

Intermediate/Long Term Recommendations:

Water supply/treatment		Redesign/upgrade	
Water supply/treatment		Replace components determined to be source of contamination or would prevent contamination	i.e. piping, filters, add wash system
Water supply/treatment	Sand filters	Replace filters according to redesign.	This might include a different filter type. A wash system needs to be included.
Water supply/treatment	Chillers/Boilers	Replace existing R22 chillers with modern water chiller technology. Replace boilers.	Existing chillers are leaking refrigerant. Production of new R22 refrigerant is banned, and eventually supply will run out.
Water supply/treatment	Distribution Piping	Replace existing pipe.	
Water supply/treatment	Distribution piping	New distribution piping should have sampling ports whereby water can be easily sampled and tested for contaminants. A PM program should be established for regular testing and annual cleaning of all lines.	
Water supply/treatment	Pumps	Replace pumps if required by redesign.	

Water supply/treatment	Pumps	Create a PM plan for recommended maintenance activities and job plans for maintenance of all critical equipment that makes up the water treatment system.	
Water supply/treatment	UV disinfection system	Replace UV system if required by redesign.	
Water supply/treatment	Aeration/degassing tower	Replace or reline. Route water through tower before final UV treatment.	Alternatives for degassing should be assessed.
Water supply/treatment	Station O&M manual	Drawings and an O&M manual should be created, and trouble shooting of this critical system. Create a PM plan for recommended maintenance activities and job plans for maintenance of all critical equipment.	

Recommended Regular Maintenance or Testing:

System	Asset	Maintenance/Testing Activity Description	Frequency
Water supply/treatment	-	Develop a testing and monitoring plan to track bacterial and algae contamination in water supply.	Upon routing water around the aeration tower and steel header a water testing plan should be developed for earliest possible detection of contaminants in the temporary piping system.
Water supply/treatment	Aeration Tower and 12” Pipe	Temporary fix will route around this area. Therefore, no maintenance/testing is required.	
Water supply/treatment	-	Decontaminate entire fish water supply system.	Annually, or more often if determined by testing/monitoring

d. Spawning Building

Basic Description:

Three-story concrete structure, folded plate/membrane roof, used for spawning and sorting activities for adult fish. Top level and mezzanine are used for visitor observation.

General Condition Description:

The Spawning Building is in generally good condition, represented by the “B” rating applied to most criteria. The building is original and showing expected signs of aging, including a leaky roof.

The evolution of work performed in this building has outgrown the original configuration/design. The working area is not conducive to the spawning operations (space limitations, work flow issues, etc). Effluent from the fish handling procedures can no longer be returned to the river, but must now enter the sanitary sewer system.

Major Concerns:

- Brail Hoist
    - Controls
    - Electro-anesthesia Equipment
    - Brail Frame
    - Hoist Accessibility

General Recommendations:

Recommended Immediate Maintenance or Testing:

System	Asset	Maintenance/Testing Activity Description	Notes
Spawning Building Brail (Redesign)	Hoist Controls	Analyze and modify limit switch/sensor devices to increase the robustness of the hoist control system and to protect against equipment damage due to misoperation.	Current operators have to carefully monitor hoist during operation to prevent two-blocking and damage to the system as the current limit switches are not reliable. Current configuration has resulted in failures and associated fish kill events.
Spawning Building Brail (Redesign)	Hoist Sizing	Increase capacity of hoist, or limit number of fish being hoisted.	Hoist can be easily overloaded. No simple way to remove fish once loaded.
Low Criticality Recommendations			
Spawning Building Brail (Redesign)	Equipment Layout/Geometry	Redesign hoisting system and brail basket. Efficient/effective maintenance cannot be performed on the hoist in its current configuration due to limited access to critical hoists and motors that require maintenance and testing.	Hoist motors/drums are not easily accessible.
Fish Distribution	Fish Chutes	Repair deteriorating fiberglass piping	Every 2 years, or as recommended by UV protectant manufacturer

e. Pre-sort Pool/Collection Pond

Basic Description:

Collection pond used as a holding location for adult fish above the fish ladder prior to the spawning building. One crowder/sweep can be used to move fish within the collection pond to the spawning building.

General Condition Description:

The collection pond is in generally good condition. The crowder/sweep is aging and has reliability issues. These issues can and have been mitigated by the operating staff through ongoing maintenance, and do not present an immediate concern to fish or personnel safety.

Recommendations:

ODFW indicates the ladder and pre-sort pond has never been dewatered. As discussed below, an effort should be made to see if the slide gates can move whereby this area can be dewatered. Upon dewatering, the fish ladder should be cleaned and inspected and the crowder should be thoroughly inspected and maintained (cleaning and re-greasing bushings, wire rope inspections, electrical cable evaluation, electrical maintenance, and water supply and drain evaluation.

f. Brood Collection Holding Ponds

Basic Description:

6 holding ponds (20'x100') are used for holding salmon and steelhead prior to spawning.

General Condition Description:

The holding ponds are in generally good condition. The crowder/sweeps are aging and have reliability issues associated with limit switches, cable reels, and cable seals. These issues can and have been mitigated by the operating staff through ongoing maintenance, and do not present an immediate concern to fish or personnel safety. However, all crowders are closely monitored during any operational activity due to these known deficiencies.

Handrails and fall protection do not meet current safety standards as installed. Refer to existing safety audit (Safety and Occupational Health Assessment – May 2018) for additional information.

Recommended Activities:

ODFW indicates the post-sort holding ponds have never been dewatered. An outage should be planned an effort should be made to see if this area can be easily dewatered. Upon dewatering, the ponds should be cleaned and inspected and the sweeps should be thoroughly inspected and maintained (cleaning and re-greasing bushings, wire rope inspections, electrical cable evaluation, electrical maintenance, and water supply and drain evaluation.

g. Fish Ladder

Basic Description:

Channel structure with a series of weirs that provides passage of salmon and steelhead to the collection pond.

General Condition Description:

The fish ladder has been continually functioning since the original construction of the facility. The watered up portions of the ladder have therefore never been inspected, cleaned, or maintained in any way. To dewater, various slide gates would need to be closed and entrance bulkheads would need to be placed. The bulkheads have never been deployed and the slide gates haven't been moved in approximately 30 years. It is unlikely that these would operate if required

General Concerns:

There are no signs of deteriorating conditions in the ladder, but the lack of inspections are a concern.

General Recommendations:

ODFW indicates the ladder and pre-sort pond has never been dewatered. As discussed above, an effort should be made to see if the slide gates can move whereby this area can be dewatered. Upon dewatering, the fish ladder should be cleaned and inspected and the sweep should be thoroughly inspected and maintained (cleaning and re-greasing bushings, wire rope inspections, electrical cable evaluation, electrical maintenance, and water supply and drain evaluation). Many of the motor mounts from on the slide gate actuators appear to be cracked or broken, it is unclear if these would operate to facilitate dewatering. Once dewatered, all slide gates should be evaluated and maintained (re-grease gear boxes, replace packing, fix motor mounts, replace gate guides, etc.).

Recommended Immediate Maintenance or Testing:

System	Asset	Maintenance/Testing Activity Description			
N/A					

Recommended Regular Maintenance or Testing:

System	Asset	Maintenance/Testing Activity Description	Frequency
Fish Ladder	Concrete Structure	Develop and implement a plan to dewater and visually inspect the ladder. This will require a mobile crane to place bulkheads.	Every 2 years
Pre-Sort Pool	Crowder	While dewatered, perform overhaul maintenance on sweeps, slide gates, and other operational equipment within the pre-sort and post-sort holding ponds.	Every 2 years

h. Rearing Ponds/Raceways

Basic Description:

A series of raceways/ponds (87 total, 20'x100') used to rear salmon, steelhead, and trout prior to release.

General Condition Description:

The rearing ponds/raceways are in generally marginal/fair condition. The surface layer concrete has worn/chipped away, exposing the rough aggregate beneath. This surface can collect/harbor waste products, pathogens, and algae, potentially impacting fish health.

Joint failure and concrete cracking of the raceways has resulted in settlement of the ponds, sinkholes in the adjacent roadways, and cross contamination potential between ponds.

Handrails and fall protection do not meet current safety standards as installed. Refer to existing safety audit (Safety and Occupational Health Assessment – May 2018) for additional information.

General Concerns:

- Surface Concrete Degradation
- Joint Failure and Concrete Cracking

General Recommendations:

Recommended Immediate Maintenance or Testing:

System	Asset	Maintenance/Testing Activity Description	Notes
Rearing Ponds	Structural Concrete	Perform a geotechnical inspection to evaluate potential damage due to settlement. Establish a plan repair rearing pond structural concrete.	Prioritized list of rearing ponds should be created to ensure only the ponds in the best conditions are utilized for rearing fish.
Rearing Ponds	Structural Concrete	Perform a civil inspection to evaluate potential repairs to surface concrete/coating.	ODFW has done preliminary research on coating solutions, but does not have a budget to act upon research

Recommended Regular Maintenance or Testing:

System	Asset	Maintenance/Testing Activity Description	Frequency		
N/A					

i. Circular (outside) Starter Ponds

Basic Description:

A series of circular ponds (Qty. 26, 25 feet diameter) designed to rear salmon, steelhead, and trout prior to release. They are not currently used for fish rearing due to insufficient design (e.g. size). Currently, a small number of trout are used for public display.

General Condition Description:

The circular ponds are in marginal/fair condition. The surface layer concrete has worn/chipped away, exposing the rough aggregate beneath.

General Concerns:

Ponds not used for rearing, thus, there are no concerns regarding condition or any immediate maintenance actions.

j. Water Supply Intake/Structure

Basic Description:

River water supply intake (cold/ambient water intake) providing water from the William L. Jess Dam (Lost Creek) tailrace. Concrete intake structure with rotating screens and a self-cleaning waterburst system. A log boom upstream of the intake prevents large floating debris from entering the intake structure.

General Condition Description:

The river water supply intake is in generally good condition. The only concerns with this area of the facility do not affect fish production goals, and are not considered major at this time.

k. Electrical Power System

Basic Description:

Power supply is provided to the hatchery substation from a single 13.8kV feeder from the Lost Creek Dam Station Service System. The substation consists of a 15kV fused-disconnect switch; a 1000kVA pad-mounted, oil-filled, step-down (13.8kV-480V) transformer; and 480V metal-enclosed switchgear with draw-out type circuit breakers. Power distribution is provided throughout the facilities by 480V control centers and lighting transformers/panelboards. A 210KW emergency generator provides (limited) backup power to essential hatchery loads.

General Condition Description:

All power related components are in relatively good operating condition considering their age. Electricians from CENWP-ODR perform annual breaker maintenance on the main supply breakers.

General Concerns:

- Lack of spill containment for oil-filled substation transformer; transformer oil could potentially make it into the river.
- Lack of spare draw-out circuit breakers for 480V metal-enclosed switchgear (failure of a breaker would severely impact hatchery operations until a replacement could be installed); some of the existing draw-out breakers do not operate as designed (electric closing coils won't charge, breakers must be operated manually).

General Recommendations:

- As a minimum, one spare draw-out circuit breaker for each frame size (800A and 1000A) should be purchased. This would be suitable as long as rating plugs from the existing breakers are interchangeable. The purchase of spares would also allow existing malfunctioning breakers to be temporarily replaced with a spare so existing breakers could be repaired.

l. Pavement and Parking Areas

Basic Description:

Asphalt roadways and parking areas throughout the facility. This includes the main roadway into the hatchery, the main parking lot, the access roads throughout the raceways, and the shop and employee parking area.

General Condition Description:

The asphalt roadway surface is aging and cracking, but is not inhibiting standard operation of the facility. Subsidence in areas around leaking holding ponds (as discussed in Section H) is mitigated by frequent repairs.

m. Other Buildings/Facilities/Structures

This section includes the following features:

System	General Condition	Affecting Operation (Y/N)	Maintenance/Testing Activity Description
Trout Building	(not used – storage)	N	
Feeder Control Buildings	Good	N	
Feed Building	Good	N	
Roofs (site-wide)	Failing	Y	Roofing systems site-wide are actively failing (leaking). This is an ongoing issue and will require complete replacement, building by building.
Fire Protection	Non-existent	N	Lack of a true fire protection system doesn't affect day-to-day operation, but is a source of concern. Portable extinguishers are the only form of fire protection on site.
Fuel Pump Station	Good	N	
Debris Boom	Failing	Y	Debris boom in front of river intake is no longer buoyant.
Outfall/Drainage Area	Good	N	
Domestic Water, Sewage, Lift Station	Good	N	Effect of effluent from spawning building on the sewage system is unknown.

General Concerns:

- Roofing Systems
- River Intake Debris Boom

General Recommendations:

Recommended Immediate Action:

System	Asset	Maintenance/Testing Activity Description	Notes
Roofing Systems	All Buildings	Fix existing leaks	ODFW already addresses this as the need arises

Recommended Capital Expenditure:

System	Asset	Maintenance/Testing Activity Description	Frequency
Roofing Systems	All Buildings	Roof Replacement	20 Years
River Intake	Debris Boom	Replace failed debris boom	Replace as fails

5. Summary

This OCA determined condition of the equipment/infrastructure in use at Cole M. Rivers Hatchery. Individual asset condition information has been provided to CENWP-ODT-F in the form of a spreadsheet with assets and A-F condition ratings. It also provided immediate regular maintenance or testing actions along with recommended preventative maintenance activities.

There are immediate actions recommended for items listed below:

- Water Treatment/Quality Issues
- Spawning Building Brail
- Raceway Surfaces/Leaks/Settlement
- Roofs

Water Treatment/Quality Issues Recommendations (summary):

Identify source of the bacterial and other contamination from the tower though the water supply pipe to the hatch house (egg incubation building). Once the source is identified, steps must be taken to mitigate contamination (bypass piping around tower, replacement of pipe to hatch house, and mitigate lost use of tower if required). An intermediate/long term action includes a redesign and upgrade to the water treatment system.

Spawning Building Brail (summary):

Analyze and modify limit switch/sensor devices to increase the robustness of the hoist control system. Increase capacity of hoist, or limit number of fish being hoisted. Redesign hoisting system and brail basket.

Raceway Surfaces/Leaks/Settlement (summary):

Perform a geotechnical inspection to evaluate potential damage due to settlement. Establish a plan to repair rearing pond structural concrete.

Roofs (summary):

Fix existing leaks. Replace roofs.

Recommended Future Activities:

It is recommended that electrical and mechanical as-built drawings be created for the facility. Correct as-builts provide critical information necessary for safe operation and maintenance of the facility and are also utilized for efficient troubleshooting during service disruptions and misoperation.

Regular Maintenance or Testing:

- Fish ladder inspections every two years
- Disinfect entire fish water supply system