Ohio Department of Natural Resources  
Castalia State Fish Hatchery  

Steelhead and Rainbow Trout Programs  

Planning, Design, Construction Administration, and Training and Commissioning Services provided by the HDR Fisheries Design Center, Springfield Illinois
HDR Scope of Services

- New Water Supply System
- New Raceway Covers & Aeration System
- New Production Building
- New Electrical Power & Emergency Power Systems
- Instrumentation, Control, alarm & Communication Systems
- Visitors Center, Restroom, & WW Facilities
Location & Site History

• North-central Ohio
• Approximately 3 miles from Lake Erie
• Site used for fish hatchery since 1870
• Originally a private facility, it was purchased by the State of Ohio in 1997
• Multiple trout fishing clubs in the area
• Natural Spring produces 2,500 – 4,000 gpm
• Water temperature constant 50.5 deg F.
Castalia Blue Hole - Spring Water Source with strict water withdrawal regulations
Blue Hole Spring produces 2,500 – 4,000 gpm to original hatchery facility
Original pump house and pumping facility
Design Challenges

- Hydric Soils – Groundwater was 1-4 ft below surface
- Potential artesian well resulting from soil borings
- Sand & Soft Silty clay soils not conducive for structural foundations or roadways. Very organic soils.
- High predation losses
- Strict draw down requirement – previous lawsuit
- Tourist Attraction – need adequate restroom and domestic wastewater treatment facilities
- Client wanted to use existing outdoor raceways and build around them
- Spring water had a natural DO of 0 ppm
Phase I Construction
Removal of organic soil for production building construction site.
Removal of four (4) feet of original earthen material.
Placement of geogrid and aggregate structural mats (3 layers)
The structural mat is approximately 5 feet thick and has 3 layers.
Structural mat and overburden rises 8 ft above the original grade.
Phase II Construction
Contractor starts by removing the top 4 feet of overburden.
Excavating down to structural mat and start placing foundation.
Begin erecting the Hatchery/Production Building
Begin constructing the water supply headtank at the production building
Work continues on the production building throughout the winter months.
The water supply headtank rises above the nearby corn fields.
Underground drains installed for the fish rearing tanks.
Foundation work on the raceway structure.
The high water table hampered construction.
Foundation walls poured on the raceway structure.
Raceway structure and by-pass channel taking shape.
Construction continues on the Raceway Structure.
Construction continues on the Raceway Structure.
Construction continues on the Raceway Structure.
Construction continues on the Raceway Structure.
Raceway Structure and by-pass channel almost complete.
Construction Complete
New Production Building & Water Supply Headtank
Water Supply Headtank
With aeration and degassing Columns. Also includes truck fill hose.
View Production Area from Visitor Education Room
Inverted High Efficiency Fluorescent Lighting – zoned for low level fish rearing
28 – 30 ft x 3 ft x 3 ft FRP Tanks with Portable Aluminum Initial Feed Training Troughs
Visitor Viewing Room with Access Controlled Door to Production Space
Biosecure Egg Disinfection Room – Egg Washing Troughs & Pass through Window to Incubation Area
Biosecure Egg Disinfection Room – Chemical Drains to Concrete Holding Vault
Formalin / Hydrogen Peroxide Vented Chemical Storage in Incubation Area
Vertical flow Egg Incubators with Bag Filtered Water Supply & Chemical Metering Systems
Incubation Area -- Egg Fungus Control Metering Pumps
Vented and Spill Containment Chemical Storage System
250-KW Emergency Generator Set, Automatic Transfer Switch and Fuel System for Entire Facility
NFPA Compliant Fuel Storage systems
Old Production Building (left) & New Raceway Covers with Rolling Access Doors
New Water Spring Water System Pump Intake Manholes
PLC Controlled Variable Speed Spring Water Pumps, 2 for Raceways and 2 for Production Building
Raceway Structure – four 20 hp pumps on the right & four degassing columns on the left.
Spring Water Pumps and Aeration /Degassing Columns in Raceway Enclosure
Raceway Enclosure with New VFD Operated Air Blowers and Aeration Diffusers
Raceway Enclosure and Aeration system – Production building Water is Reused in Raceways
Great Lakes Steelhead-RBT in Baffled Production Raceways with New Biosecure Raceway Enclosures
Low Pressure Air Blower Variable Frequency Drive Controllers - Air Production Output Meets Aeration Needs
Aeration Sled in Operation using LP Air System
# PLC-Based Hatchery Instrumentation, Alarm and Control System

## Analog Signals

<table>
<thead>
<tr>
<th>Message</th>
<th>Date</th>
<th>Time</th>
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<tbody>
<tr>
<td>FILTER 1 HIGH DIFF. PRESSURE</td>
<td>11/03/11</td>
<td>10:20am</td>
</tr>
<tr>
<td>RH LPAB HIGH FLOW ALARM DIS</td>
<td>11/03/11</td>
<td>10:16am</td>
</tr>
<tr>
<td>RH LPAB LOW FLOW ALARM DIS</td>
<td>11/03/11</td>
<td>10:16am</td>
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</tbody>
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### Headtank Water Level
- **Value**: 121.10 in.
- **Unit**: Upper Supply D.O.
- **PPM**: 10.66 ppm
- **Temp**: 52.03 °F

### Blue Hole Water Level
- **Value**: 18.50 in.
- **Unit**: Upper Supply Temperature
- **PPM**: 10.50 ppm
- **Temp**: 52.22 °F

### Headbox Flow
- **Value**: 0 gpm
- **Unit**: Upper Discharge D.O.
- **PPM**: 11.22 ppm
- **Temp**: 51.88 °F

### Headtank Supply Flow
- **Value**: 2690 gpm
- **Unit**: Upper Discharge Temperature
- **PPM**: 9.32 ppm
- **Temp**: 52.22 °F

### West Building Supply Flow
- **Value**: 987 gpm
- **Unit**: Middle Supply D.O.
- **PPM**: 9.58 ppm
- **Temp**: 52.17 °F

### East Building Supply Flow
- **Value**: 1313 gpm
- **Unit**: Middle Supply Temperature
- **PPM**: 9.53 ppm
- **Temp**: 51.80 °F

### Incubation Flow
- **Value**: 113 gpm
- **Unit**: Middle Discharge East D.O.
- **PPM**: 10.45 ppm
- **Temp**: 52.03 °F

### Raceway Flow
- **Value**: -1 gpm
- **Unit**: Middle Discharge East Temp.
- **PPM**: 11.62 ppm
- **Temp**: 52.22 °F

### Headtank D.O.
- **Value**: 10.45 ppm
- **Unit**: Middle Discharge West D.O.
- **PPM**: 10.17 ppm
- **Temp**: 52.17 °F

### Headtank Temperature
- **Value**: 56.75 °F
- **Unit**: Lower Discharge Temperature
- **PPM**: 5.17 ppm
- **Temp**: 52.17 °F
Above grade domestic wastewater leach fields – one used now and one for future use
Facility Summary

Production Building Design Flow = 2,600 gpm
Raceway Structure Design Flow = 3,600 gpm

Facility produces 400,000 Steelhead Trout/year (60k lbs), and 90,000 catchable Rainbow Trout/year (50k lbs)

Phase 1 Construction Cost = $445,000
Phase 2 Construction Cost = $5,513,000
Thank You!

Questions?

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