

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



Original Castalia Raceway – 1,000 ft long

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



12/15/2010 10:18

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.



11/15/2010 10:50

The high water table hampered construction.



Foundation walls poured on the raceway structure.



04/06/2011 09:30

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



Portable Feed Training Toughs and LP Air Colorite Diffusers



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



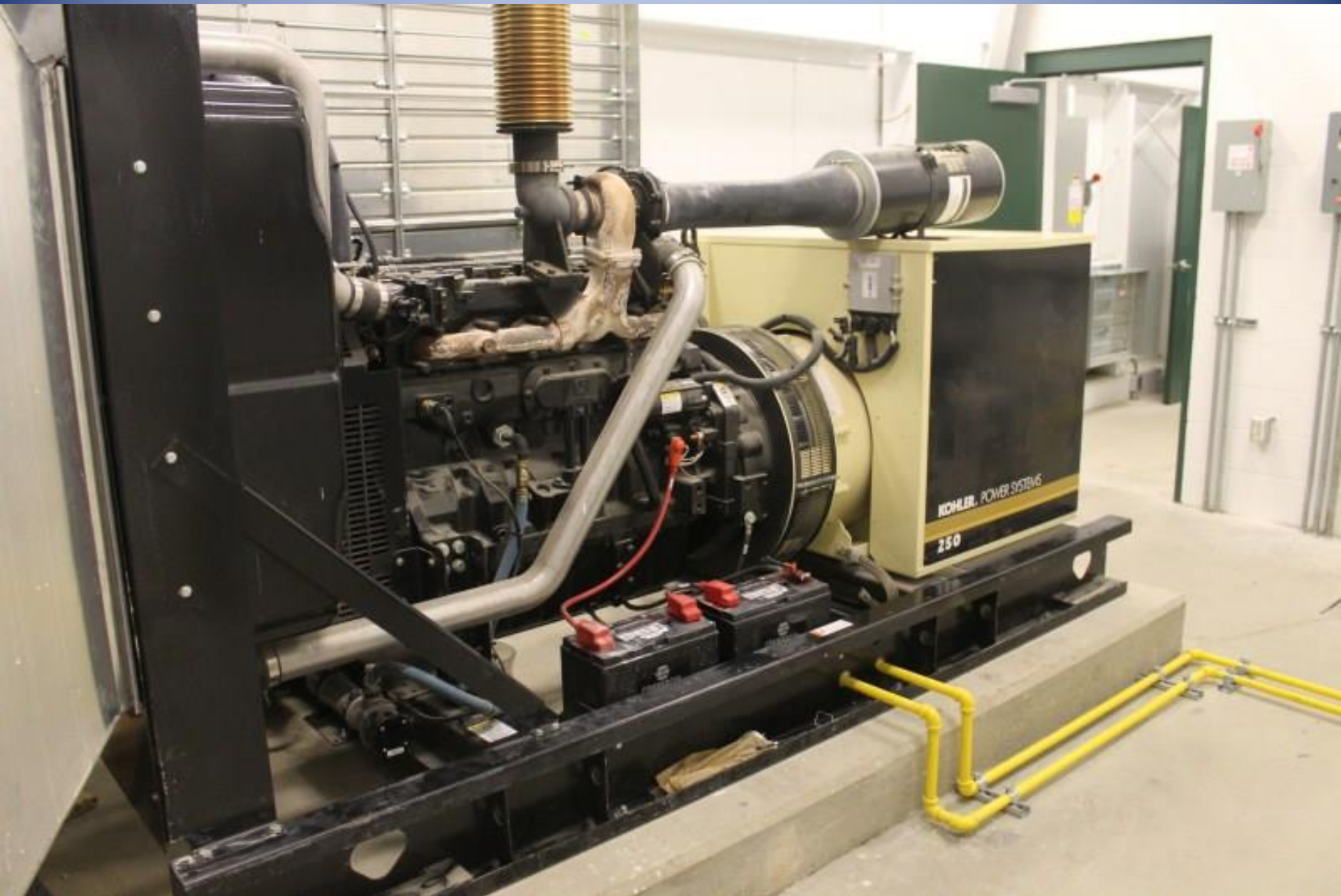
Vented and Spill
Containment Chemical
Storage System



Stainless Steel Sediment Bag Filters and Booster Pumps – Incubation Water system



Duplex Low Pressure Air blowers – Production Building LP Air 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.



Variable Frequency Drive (VFD) Spring Water Pump Controllers



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



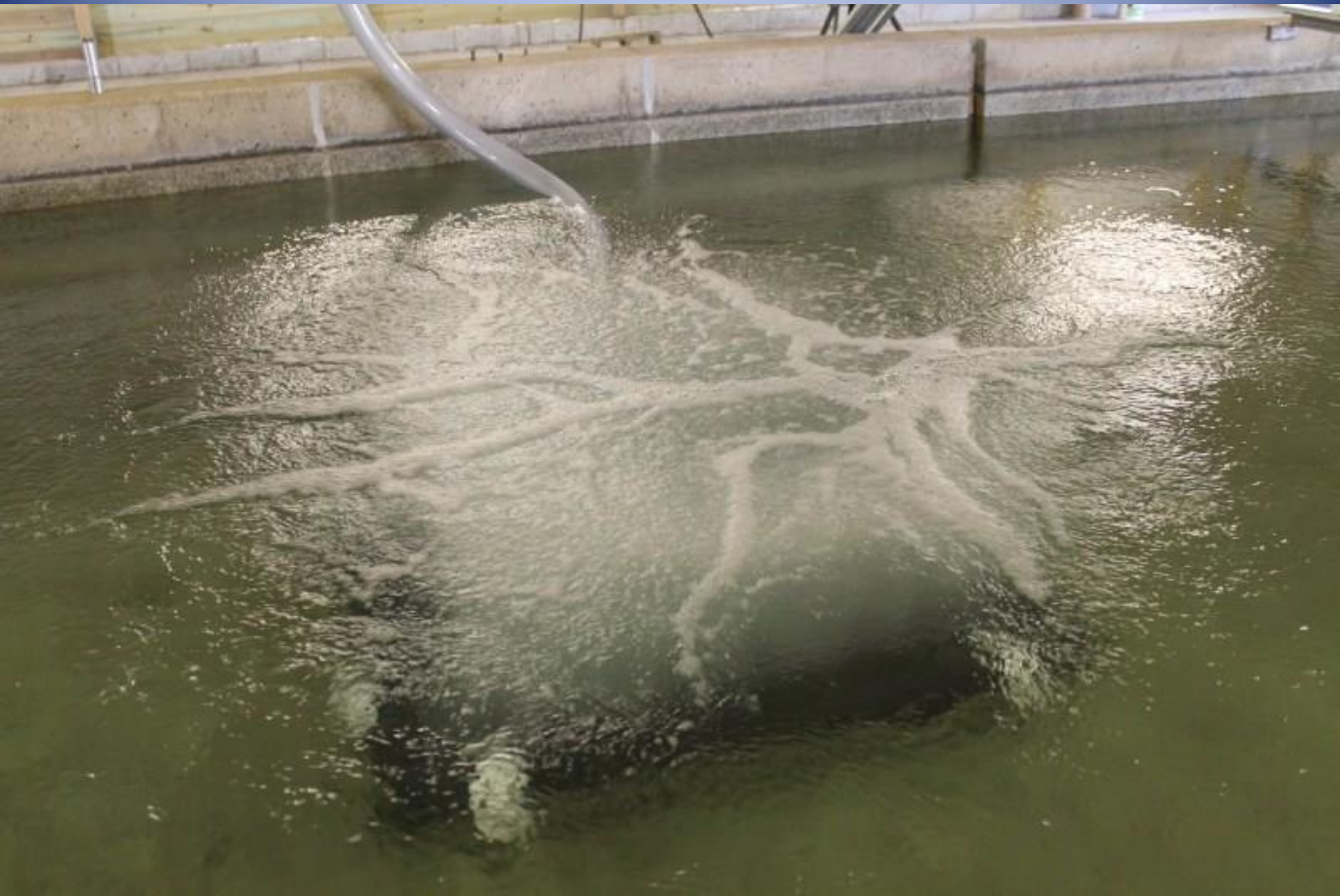
VFD Controlled Positive Displacement Air Blowers in Sound Enclosures-Raceway Aeration System



Low Pressure Air Blower Variable Frequency Drive Controllers-Air Production Output Meets Aeration Needs



Removable Colorite Aeration Tubing Aeration Sled in Raceway



Aeration Sled in Operation using LP Air System

10:25am		ANALOG SIGNALS				11/03/2011	
MENU		Message	Date	Time	ALARM HISTORY		
BACK		▶ FILTER 1 HIGH DIFF. PRESSURE	11/03/11	10:20am	▲		
INFO		RH LPAB HIGH FLOW ALARM DIS	11/03/11	10:16am	▼		
		RH LPAB LOW FLOW ALARM DIS	11/03/11	10:16am			
HEADTANK WATER LEVEL	121.10	in.	UPPER SUPPLY D.O.	10.66	ppm		
BLUE HOLE WATER LEVEL	18.50	in.	UPPER SUPPLY TEMPERATURE	52.03	*F		
HEADBOX FLOW	0	gpm	UPPER DISCHARGE D.O.	10.50	ppm		
HEADTANK SUPPLY FLOW	2690	gpm	UPPER DISCHARGE TEMPERATURE	52.22	*F		
WEST BUILDING SUPPLY FLOW	987	gpm	MIDDLE SUPPLY D.O.	11.22	ppm		
EAST BUILDING SUPPLY FLOW	1313	gpm	MIDDLE SUPPLY TEMPERATURE	51.88	*F		
INCUBATION FLOW	113	gpm	MIDDLE DISCHARGE EAST D.O.	9.32	ppm		
RACEWAY FLOW	-1	gpm	MIDDLE DISCHARGE EAST TEMP.	52.22	*F		
HEADTANK D.O.	10.45	ppm	MIDDLE DISCHARGE WEST D.O.	9.58	ppm		
HEADTANK TEMPERATURE	11.62	*F	MIDDLE DISCHARGE WEST TEMP.	52.17	*F		
HEADBOX D.O.	10.17	ppm	LOWER DISCHARGE D.O.	9.53	ppm		
HEADBOX TEMPERATURE	56.75	*F	LOWER DISCHARGE TEMPERATURE	51.80	*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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