LADDER COOLING

Process
Prototyping
Field Tests
CFD Modeling

U.S. ARMY

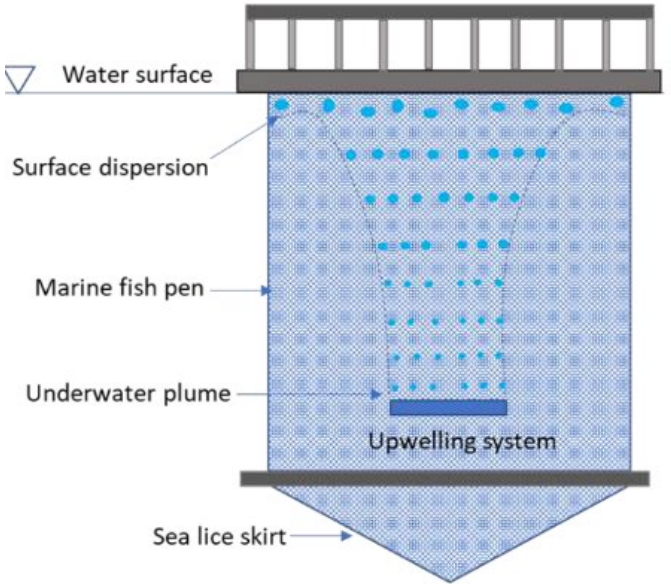
US Army Corps of Engineers®

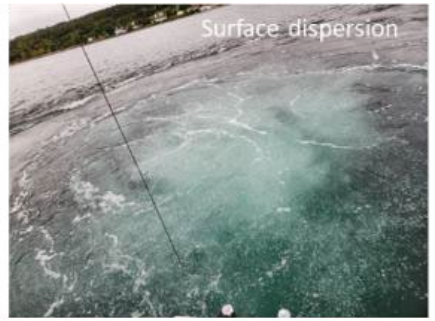
OVERVIEW

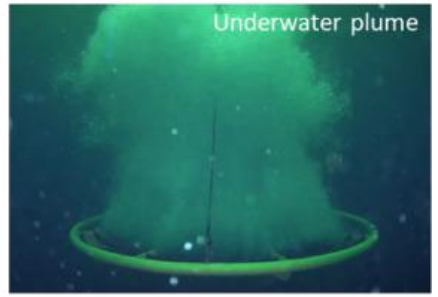
- Proceed with DDR development
- Alternatives identified within the alternatives analysis for Lower Monumental and McNary Dams.
- Will develop scope of work with FFDRWG for key the alternatives.
- Intent is to potentially award contract for 100% design pending prototype testing this winter.
- Lower Monumental – Diffuser Screens or Spray Bar
- McNary - Chimney with Diffuser Screens

THE BUBBLER

- Bubbler alternative had the lowest cost and least O&M among the alternatives considered and can be implemented in a short timeframe.
  - Uncertainty in performance
- Developing a plan to test prototype at Lower Monumental Lock and Dam (LoMo).
- Observed air wand test at anticipated diffuser location to assess initial flow patterns.
- Hoping to implement and test before increased water temperatures occur in summer 2026.







FIELD TEST – AGAINST US DAM FACE

- Air wand bubbler test 02OCT25
- Unknown air flow
- Pushing debris ~75’
- Surface velocity towards exit ~0.25 ft/s
- Intend to keep enough distance between plume and ladder exit to not increase air in ladder.

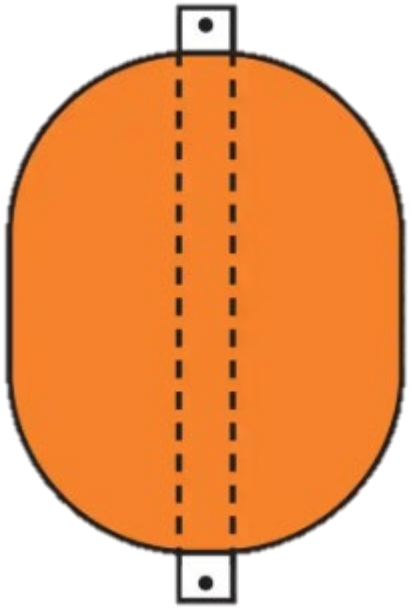
FIELD TEST - 2

Air wand bubbler test 02OCT25.

PROTOTYPING

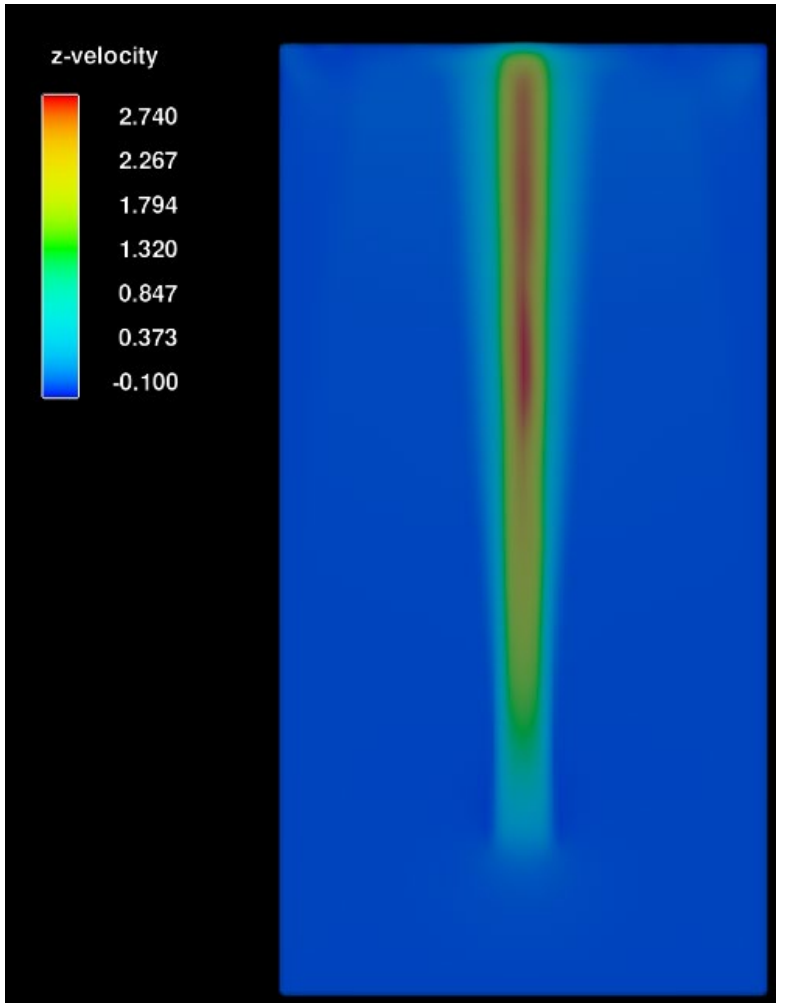
We have received quotes for our proposed diffuser system prototype.

- 70” SalmoAir Diffuser
- 300 lb concrete pyramid anchor
- Model B1830B Type B Barrier Float
- Model B1130A Type A Barrier Float
- Various wire ropes, shackles and clamps.



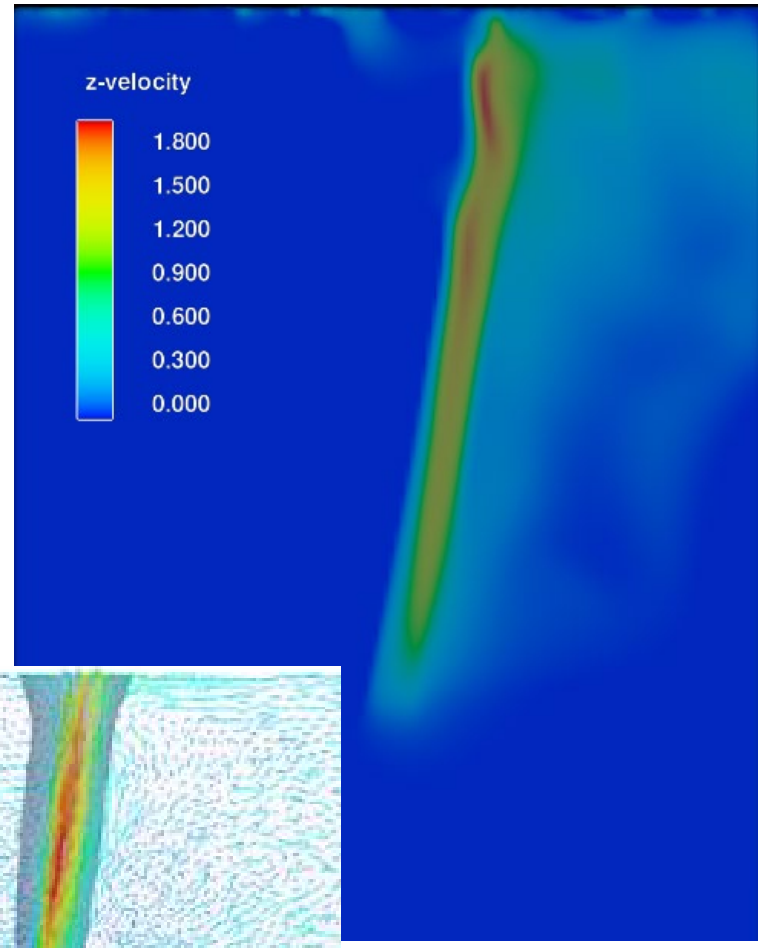
INITIATING CFD EVAL

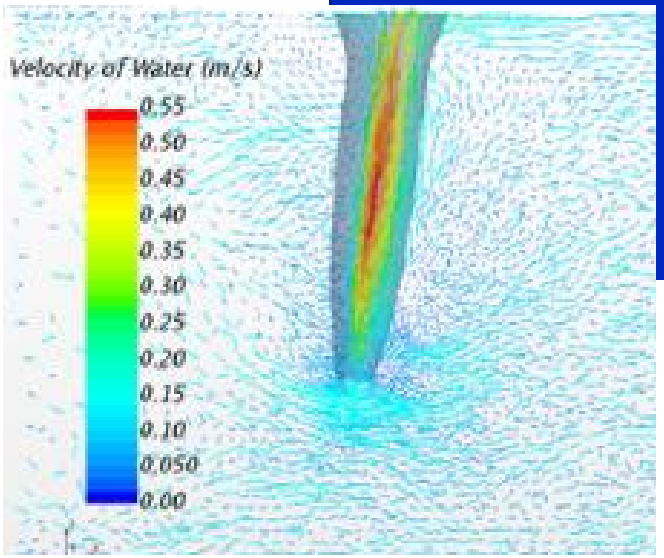
- Will use computational fluid dynamics (CFD) software, Flow-3D to model the diffuser with the goal of estimating upwell flow rates, thermal changes and ladder temperature.
- Currently modeling SalmoAir diffuser tests conducted by ASME to calibrate model parameters to known physical measurements and models.
- Once calibrated, we will begin CFD modeling the forebay of LoMo with the diffuser to assess affects on the fish ladder.



CFD – FLOW 3D

- In the process of modeling the SalmoAir diffuser
- Replicating measured prototype results from “VALIDATION AND VERIFICATION FIELD TRIALS OF AIR DIFFUSER SYSTEMS FOR UPWELLING APPLICATIONS”
- Modeling simplified versions of anticipated setup for LOMO while waiting for bathometry data.





Top Image: USACE CFD model results (ft/s)
Bottom Image: CFD results from above report (m/s).

- Both have same scale