

Information for the WATER Fish Facility Design Group Meeting, 11/01/16

Foster Downstream Fish Passage Design Updates:

Hydraulics:

- Foster Fish Weir Size: excel file used to determine foster fish weir size for 860 cfs and 500 cfs utilizing the same weir design

-Foster Fish Weir shaping of weir crest:

1) Foster Fish Shaped Weir CFD - Screenshot from the CFD computer model displaying velocity magnitude (by color) over the proposed weir shaped design and streamlines (by arrows) that stop at velocity magnitude of ~8 ft/sec (capture velocity).

2) Foster Fish Shaped Weir CFD -AVI (not attached but will be shown during meeting) showing particles moving through the fluid domain. The data can be used to extract acceleration data, making sure we don't violate the 0.2 ft/sec/ft criteria).

-Foster Fish Weir Trajectory for 800 cfs and 500 cfs

Structures:

- Foster Weir Structure: Structural design screen shots

1) Front Elev

2) Front Iso

3) Front Opening

4) Rear Elev

5) Rear Iso

6) Rear Opening

Note: 30%DDR shows a stiffener in the center of the weir. The current design does not have a stiffener impacting the weir flow.

Recreational Impacts/Comparison of Fish Passage Alternatives:

- 1) Preferred Alternative
 - a. Operate the fish weir from 01 Oct to 15 May
 - b. 500 cfs over the fish weir
- 2) Requested Simulation
 - a. Operate the fish weir from 01 Oct to 15 Jun
 - b. 500 cfs over the fish weir
- 3) Model Information
 - a. Period of Simulations-01 Oct 1935 through 31 Dec 2008
 - b. Daily Time Step

Foster Downstream Passage
Modified Weir Design

8/16/2016

b'

(
EL Ht abv Spillway

Q = 500 & 860 cfs

Min. Cons. Pool = 613

16.21

WSEL 613-633

Max. Cons. Pool = 637

40.21

Weir Equation:

Maximum Width of Weir = 22 ft.

Difference 24 24

Q=cbH^{3/2}

Spillway Crest EL 596.79

Q/(c*H^{3/2})

Broad Crested Weir Breadth 3-4 ft. & Head >5.5 ft. Coefficient

C = 3.32

(Handbook of Hydraulics (Brater & King) Table 5-3)

Cw = 3.32 NOTE: for shaped weir like the JDA TSW, Cw = 3.95

Assume only one weir width

for both fish weir flows of

Width of Weir b= Q/(c*H^{3/2}) (b max = 22 ft based on existing drawings).

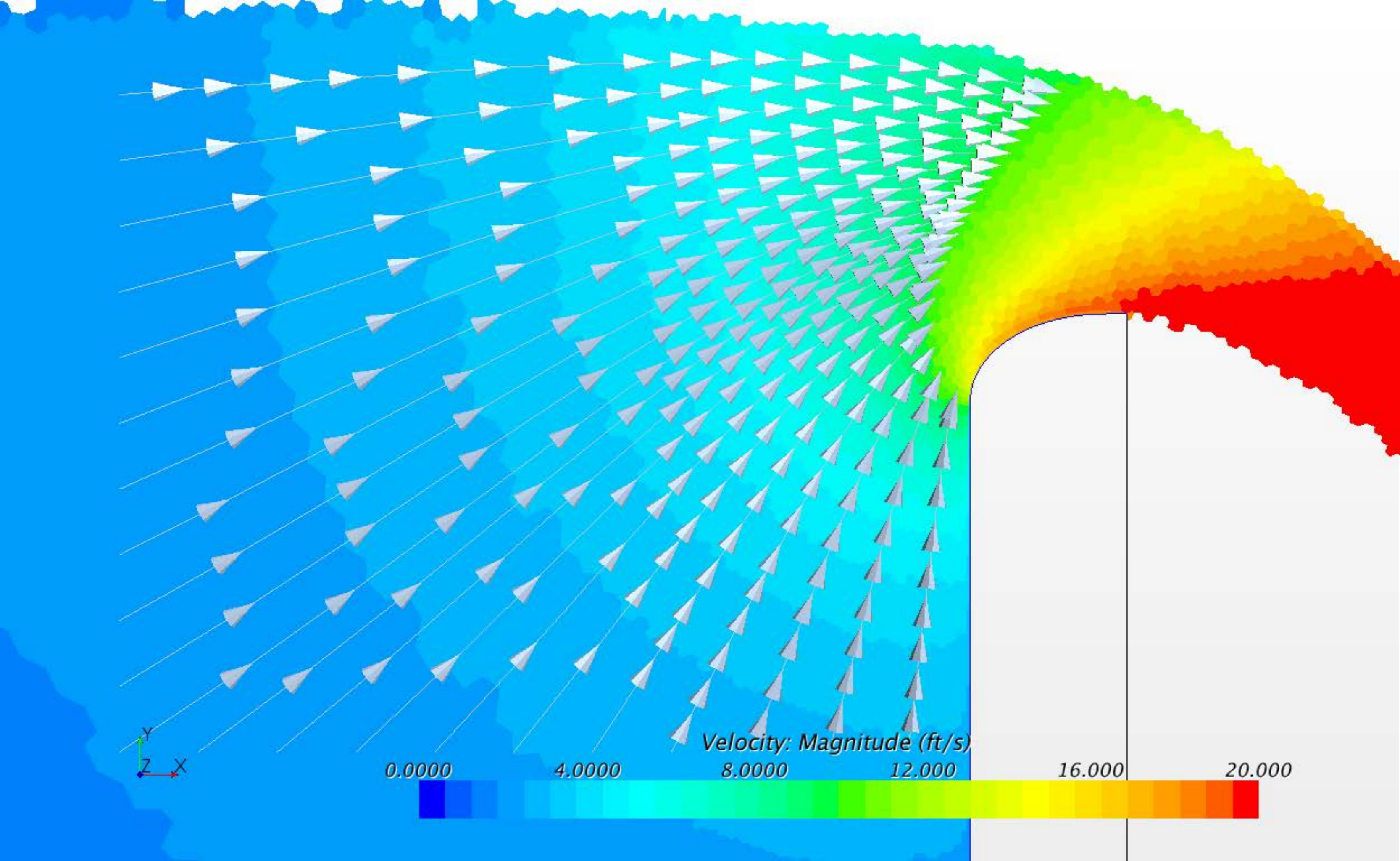
860, 500 cfs at both EL 614 and 637 ft.

ASSUME MAX Q 860cfs DEFINES Width = 17.6 ft.

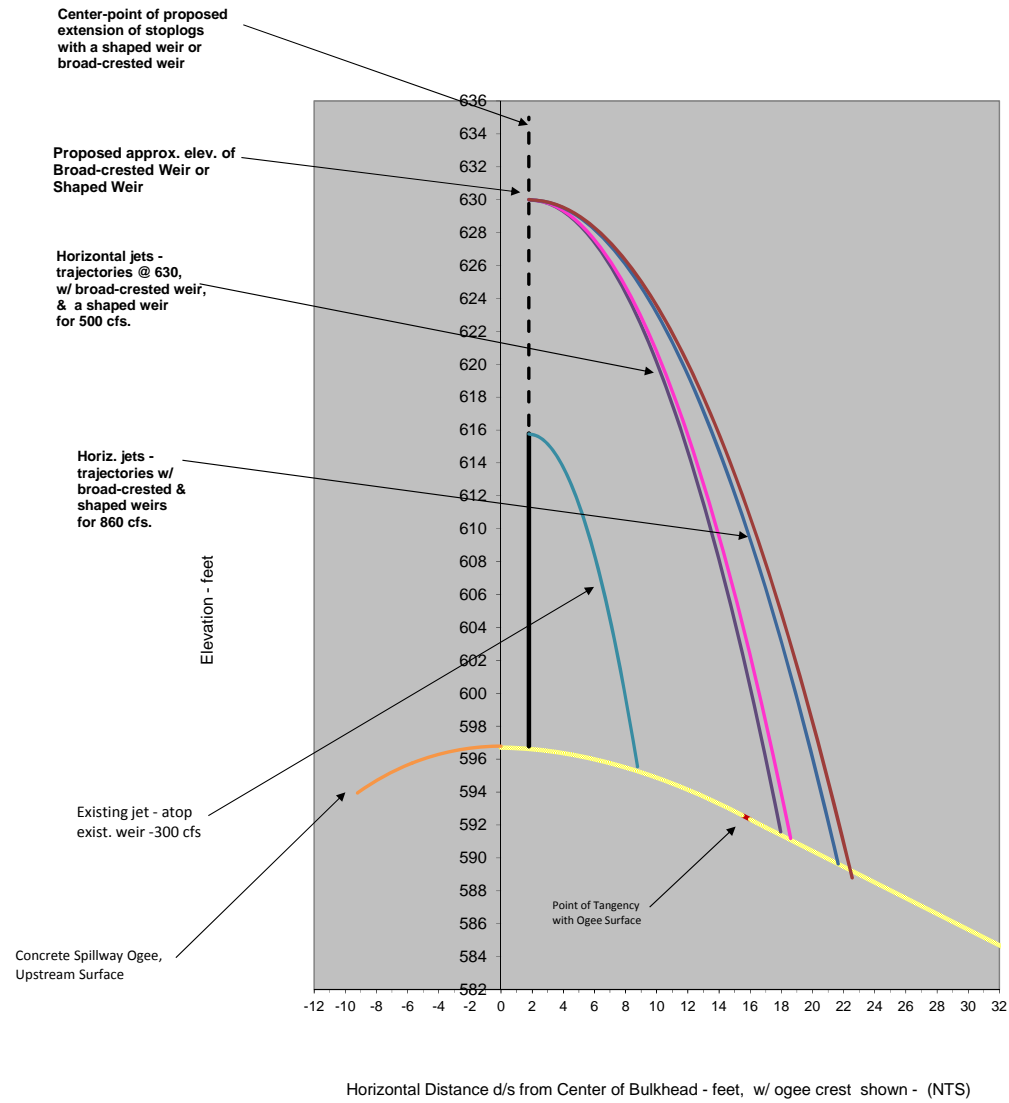
Q= (cfs) 860

Q= (cfs) 500

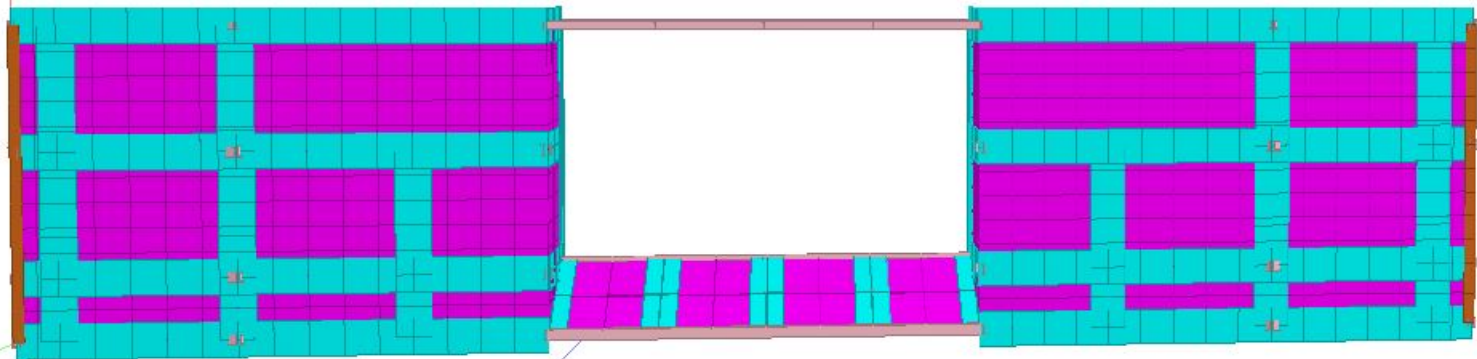
| Q= (cfs) 860 | | | | | | | Q= (cfs) 500 | | | | | | | | | |
|----------------------------------|------|----|------------------|-----------|------------|---------|----------------------------------|---------------------------------|------|----|------------------|-----------|------------|---------|---------------------|---------------------|
| H= height of water above stoplog | | | | | | | H= height of water above stoplog | | | | | | | | | |
| Q | c | H | H ^{3/2} | b = width | V=Velocity | Weir EL | Weir EL at Max Pool | Q | c | H | H ^{3/2} | b = width | V=Velocity | Weir EL | Weir EL at Min Pool | Weir EL at Max Pool |
| 860 | 3.32 | 2 | 2.8 | 91.6 | 4.7 | | | 500 | 3.32 | 2 | 2.8 | 53.2 | 4.7 | | | |
| 860 | 3.32 | 3 | 5.2 | 49.9 | 5.8 | | | 500 | 3.32 | 3 | 5.2 | 29.0 | 5.8 | | | |
| 860 | 3.32 | 4 | 8.0 | 32.4 | 6.6 | | | 500 | 3.32 | 4 | 8.0 | 18.8 | 6.6 | | | |
| 860 | 3.32 | 5 | 11.2 | 23.2 | 7.4 | | | 500 | 3.32 | 5 | 11.2 | 13.5 | 7.4 | | | |
| 860 | 3.32 | 6 | 14.7 | 17.6 | 8.1 | | | 500 | 3.32 | 6 | 14.7 | 10.2 | 8.1 | | | |
| 860 | 3.32 | 7 | 18.5 | 14.0 | 8.8 | 606.0 | 630.0 | 500 | 3.32 | 7 | 18.5 | 8.1 | 8.8 | | | |
| 860 | 3.32 | 8 | 22.6 | 11.4 | 9.4 | 605.0 | 629.0 | 500 | 3.32 | 8 | 22.6 | 6.7 | 9.4 | | | |
| 860 | 3.32 | 9 | 27.0 | 9.6 | 10.0 | 604.0 | 628.0 | 500 | 3.32 | 9 | 27.0 | 5.6 | 10.0 | | | |
| 860 | 3.32 | 10 | 31.6 | 8.2 | 10.5 | 603.0 | 627.0 | 500 | 3.32 | 10 | 31.6 | 4.8 | 10.5 | | | |
| 860 | 3.32 | 11 | 36.5 | 7.1 | 11.0 | 602.0 | 626.0 | 519.7 | 3.32 | 5 | 11.2 | 14.0 | 7.4 | 608.0 | 632.0 | |
| 860 | 3.32 | 12 | 41.6 | 6.2 | 11.5 | 601.0 | 625.0 | Q=(c*b*H ^{3/2}) trial | | | | | | | | |
| 860 | 3.32 | 13 | 46.9 | 5.5 | 12.0 | 600.0 | 624.0 | Width in red | | | | | | | | |
| 860 | 3.32 | 14 | 52.4 | 4.9 | 12.4 | 599.0 | 623.0 | | | | | | | | | |
| 860 | 3.32 | 15 | 58.1 | 4.5 | 12.9 | 598.0 | 622.0 | | | | | | | | | |
| 860 | 3.32 | 16 | 64.0 | 4.0 | 13.3 | 597.0 | 621.0 | | | | | | | | | |
| 860 | 3.32 | 17 | 70.1 | 3.7 | 13.7 | 596.0 | 620.0 | | | | | | | | | |
| 860 | 3.32 | 18 | 76.4 | 3.4 | 14.1 | 595.0 | 619.0 | | | | | | | | | |
| 860 | 3.32 | 19 | 82.8 | 3.1 | 14.5 | 594.0 | 618.0 | | | | | | | | | |
| 860 | 3.32 | 20 | 89.4 | 2.9 | 14.8 | 593.0 | 617.0 | | | | | | | | | |
| 860 | 3.32 | 21 | 96.2 | 2.7 | 15.2 | 592.0 | 616.0 | | | | | | | | | |
| 860 | 3.32 | 22 | 103.2 | 2.5 | 15.6 | 591.0 | 615.0 | | | | | | | | | |
| 860 | 3.32 | 23 | 110.3 | 2.3 | 15.9 | 590.0 | 614.0 | | | | | | | | | |
| 860 | 3.32 | 24 | 117.6 | 2.2 | 16.3 | 589.0 | 613.0 | | | | | | | | | |
| 860 | 3.32 | 25 | 125.0 | 2.1 | 16.6 | 588.0 | 612.0 | | | | | | | | | |

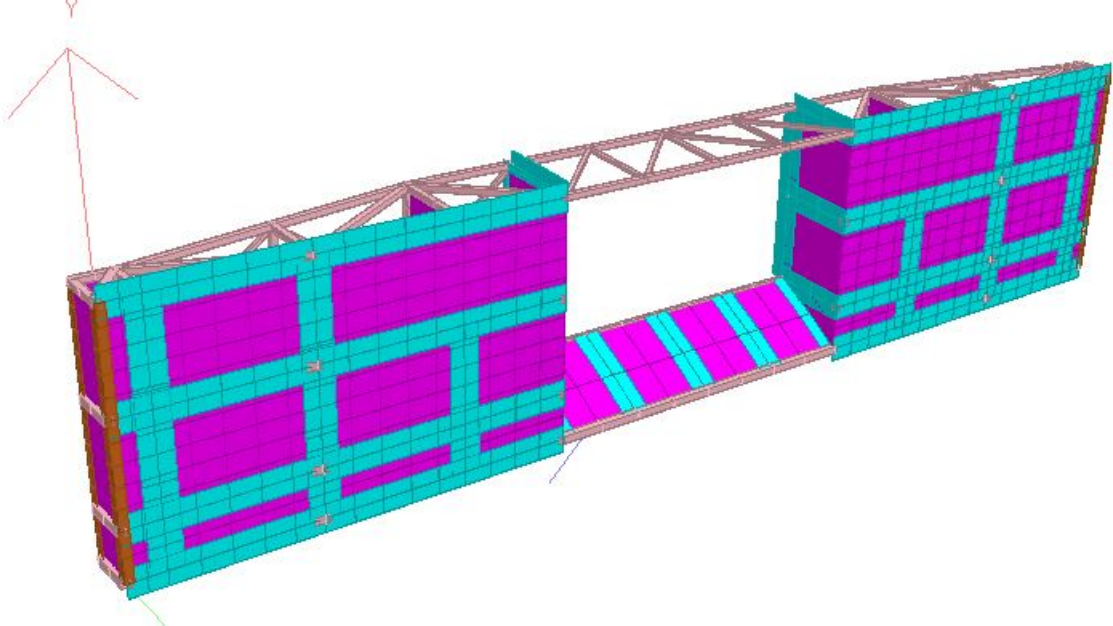


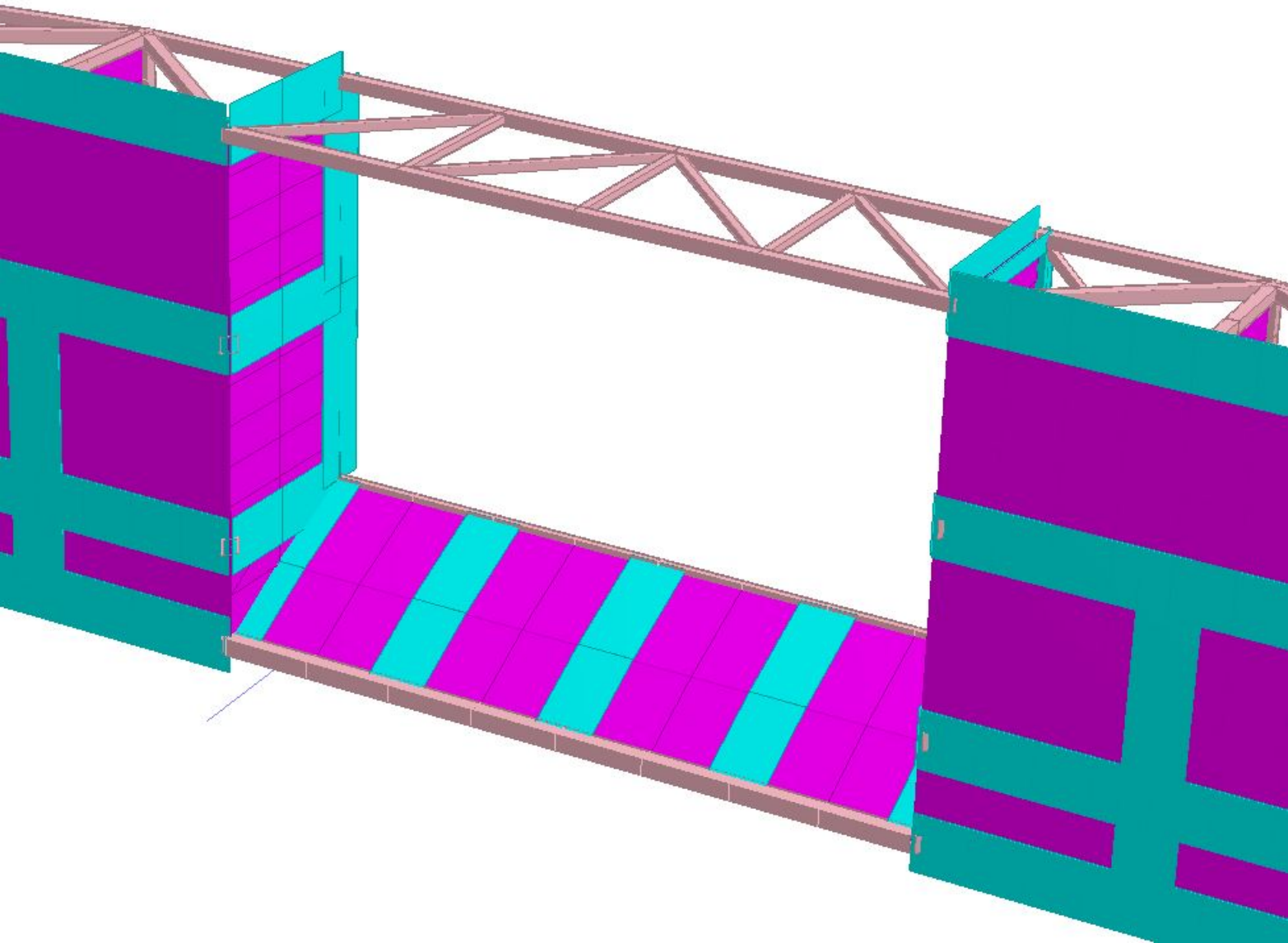
Foster Weir Flow trajectory- over U/S Bulkhead

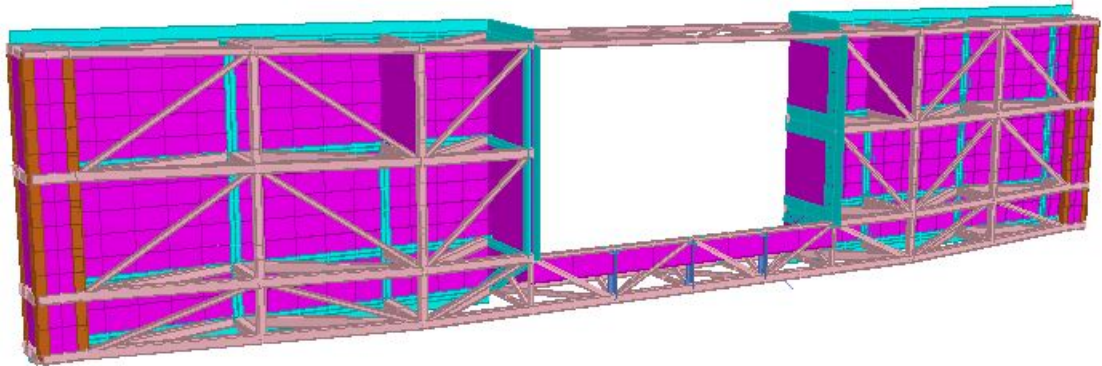


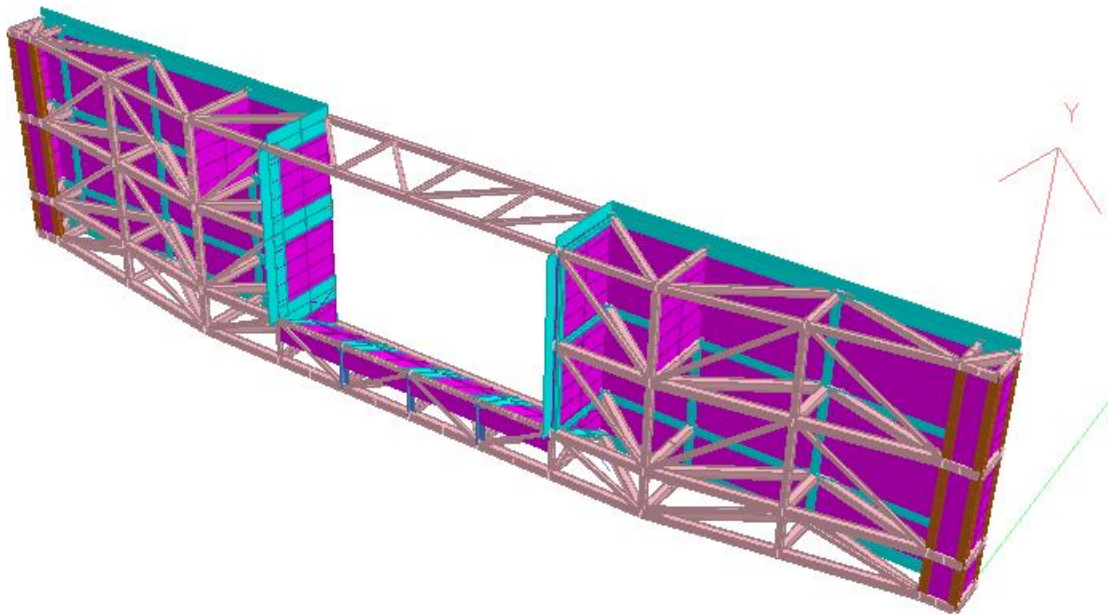
Horizontal Distance d/s from Center of Bulkhead - feet, w/ ogee crest shown - (NTS)

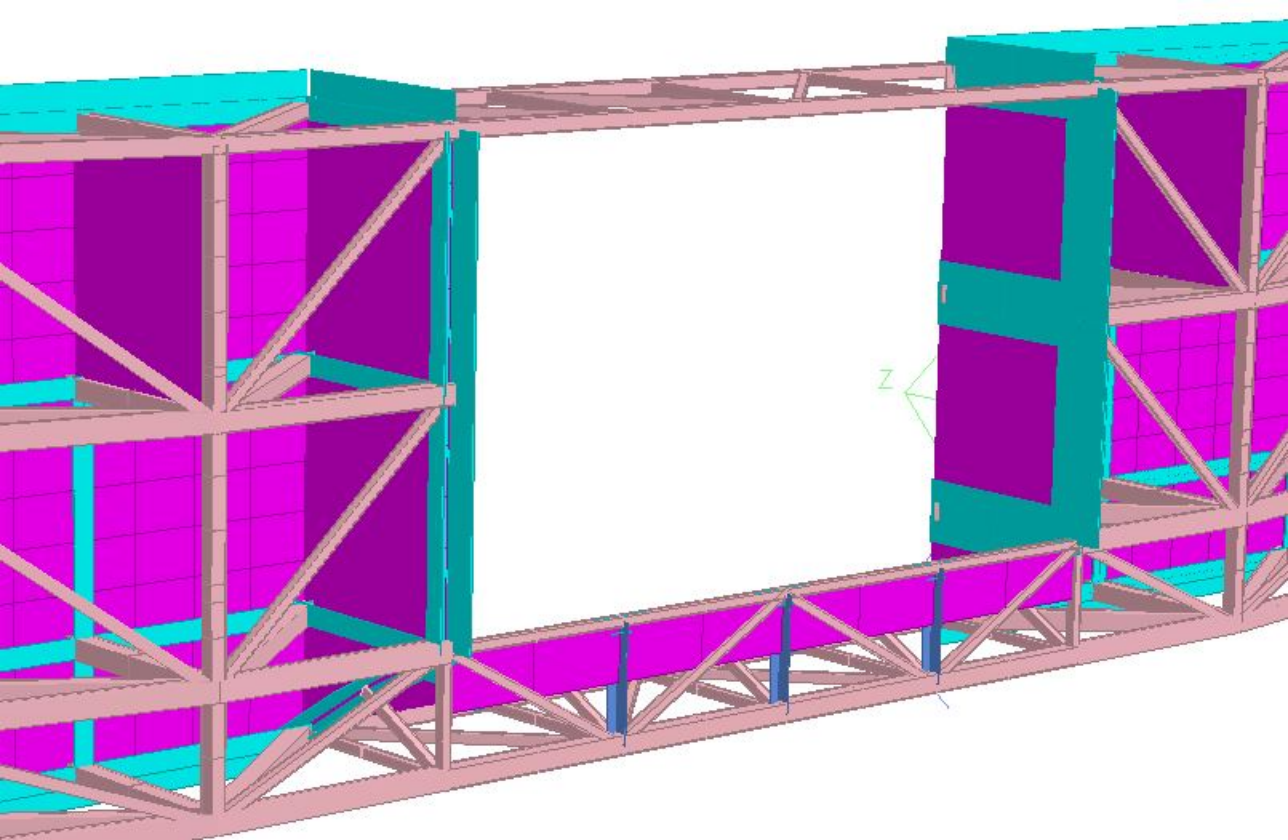












Comparison of Fish Passage Alternatives

Preferred Alternative

- Operate the fish weir from 01 Oct to **15 May**
- 500 cfs over the fish weir

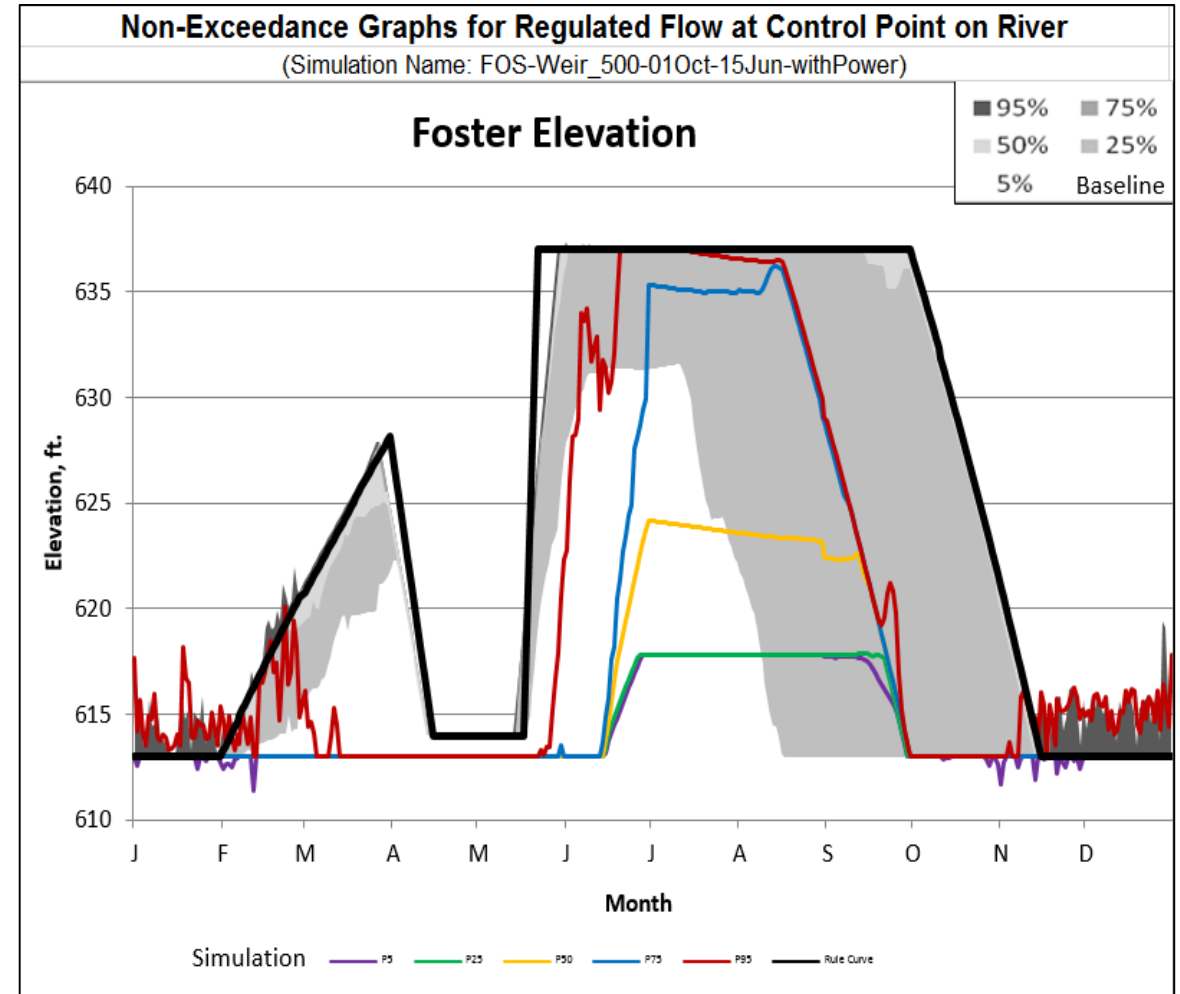
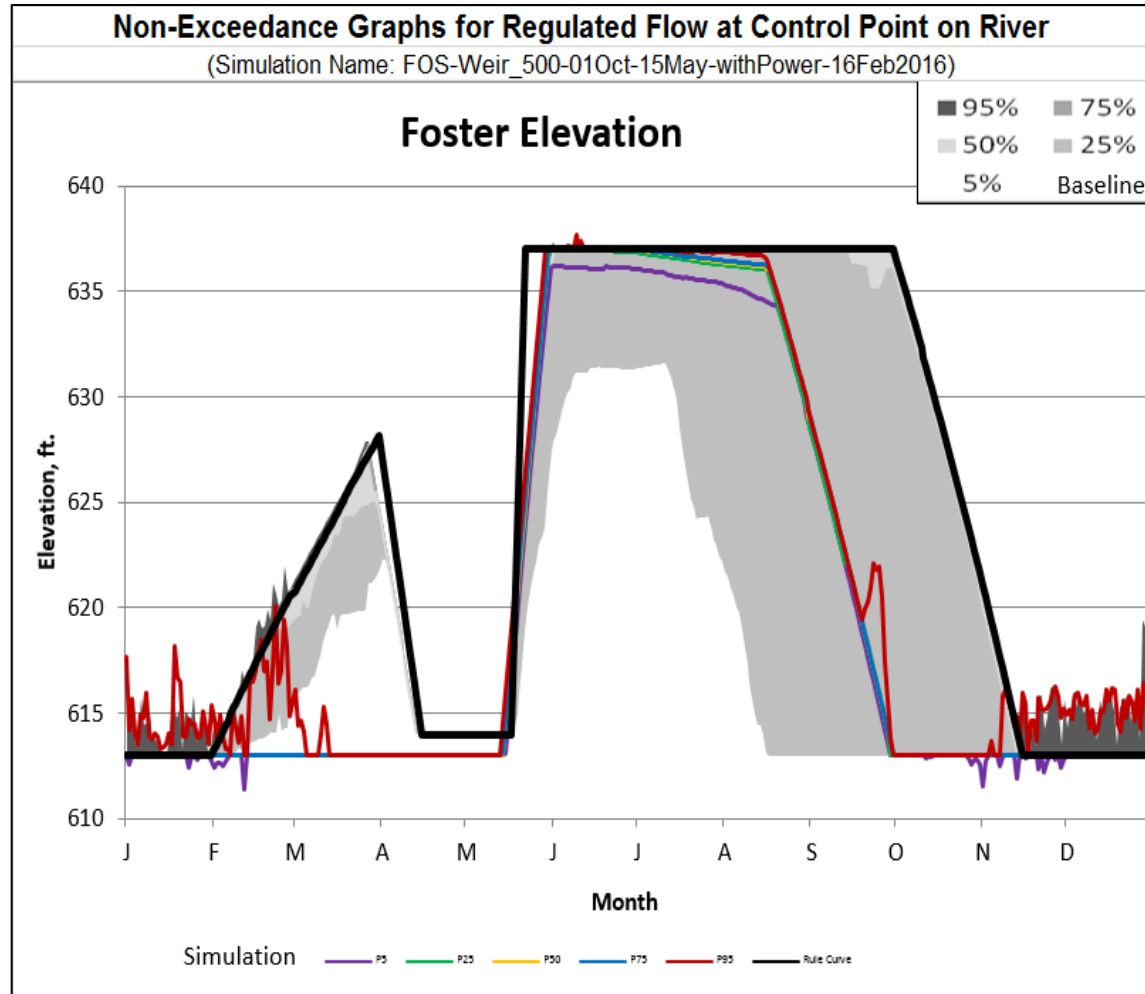
Requested Simulation

- Operate the fish weir from 01 Oct to **15 Jun**
- 500 cfs over the fish weir

Model Information

- Period of Simulations – 01 Oct 1935 through 31 Dec 2008
- Daily Time Step

Pool Elevation Comparisons



Foster Recreational Impacts

Oct 01-May15 Alt Compared to Oct 01-Jun15 Alt

