

Bonneville Washington Shore Minor Modifications: Lamprey orifices

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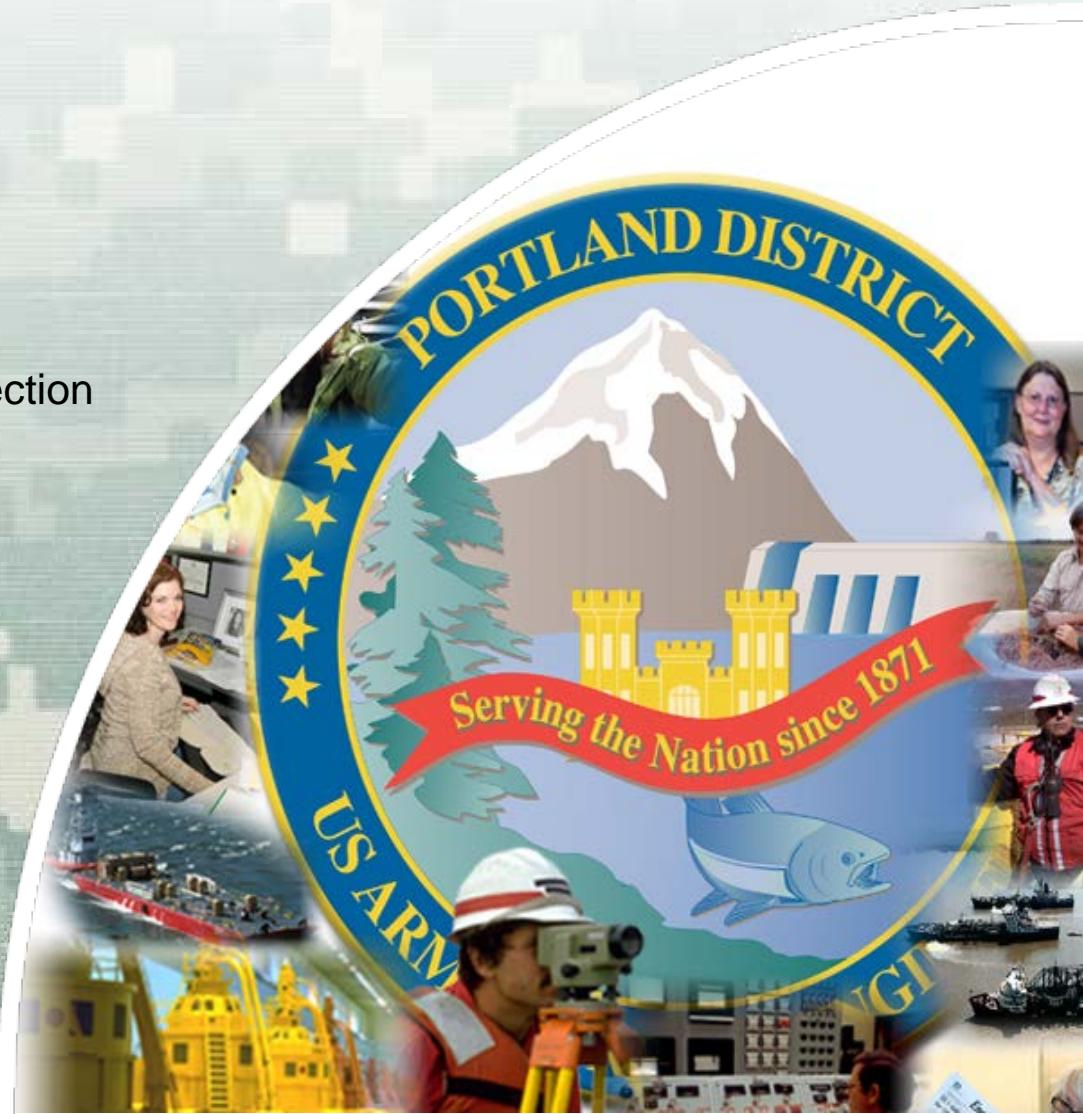
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FFDRWG

22 May 2018

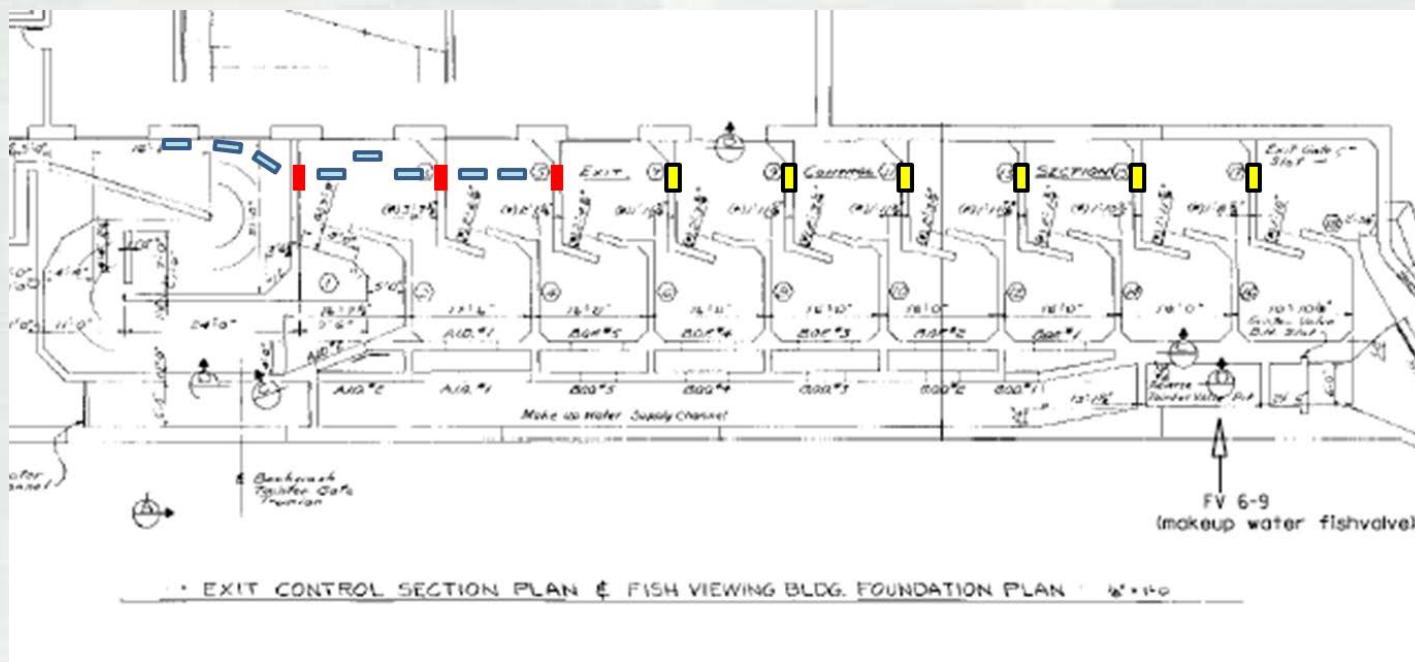


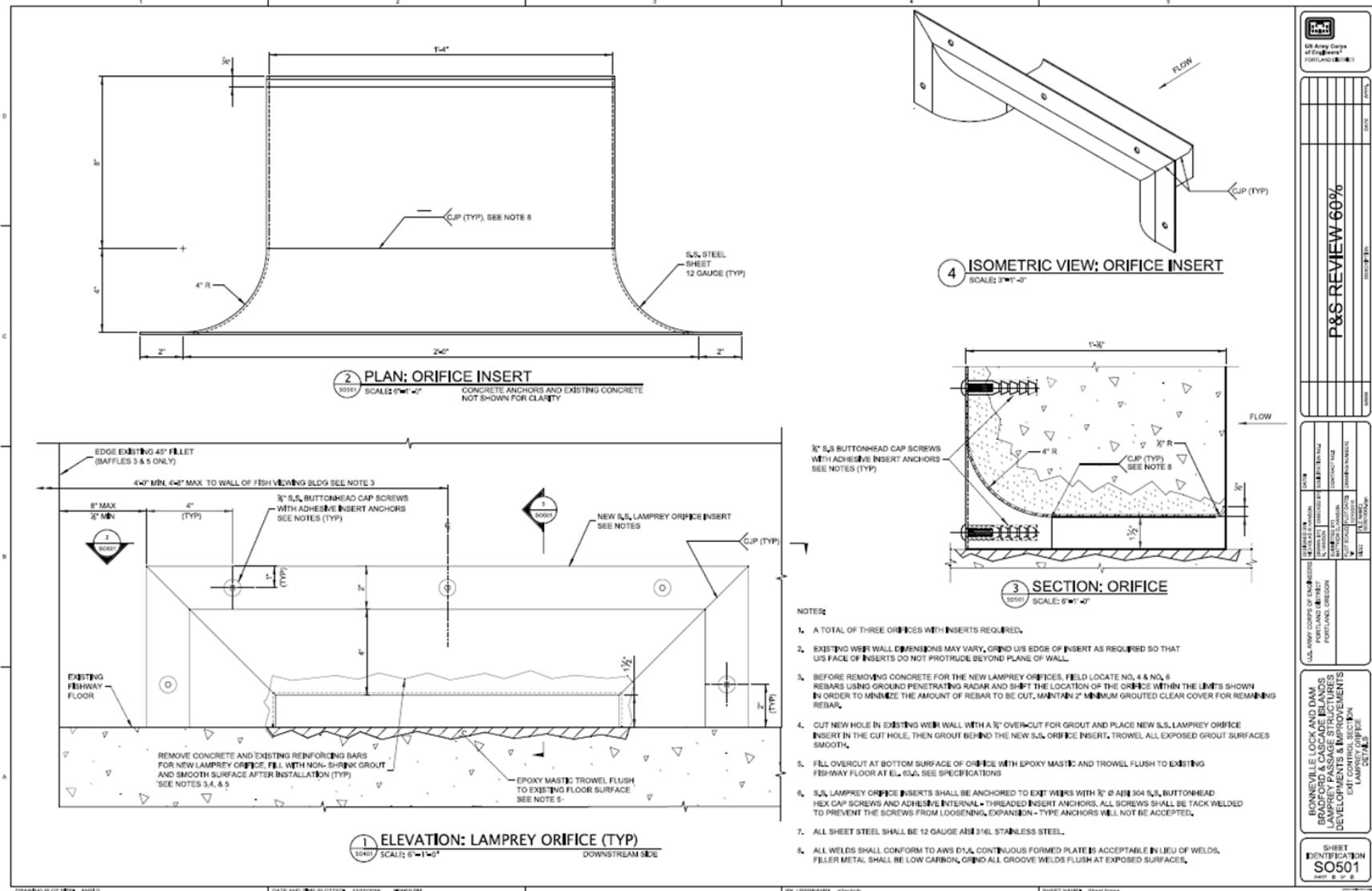
US Army Corps of Engineers
BUILDING STRONG®



Proposed locations

- 3 Currently installed at weirs 1, 3, and 5 (red boxes)
- Proposed an additional 6 orifices at weirs 7, 9, 11, 13, 15, and 17 (yellow boxes)
 - No additional monitoring proposed
 - No closure devices to be installed
 - Removal of current closure devices and video rails at weirs 1, 3, and 5.
 - Fill in orifice at weir 1





Orifice is 1.5 inches by 16 inches long





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DATE AND TIME PLOTTED: 12/15/2016 08:03 PM BY USERNAME: g2wodsh SHEET NAME: Sheet No. 1

DRAWINGS PLOT SIZE AND D

DATE AND TIME PLOTTED 12/11

BY USERNAME (2000)

SHEET NAME: Sheet N

A ELEVATION: DOWNSTREAM FACE OF BAFFLE (TYP)

SECTION B ELEVATION: UPSTREAM FACE OF BAFFLE (TYPE 1)

A ELEVATION
50101 SCALE 1"

B ELEVA
50101 SCALE 1:1

1. **ADJUST LOCATIONS OF CAMERA MOUNTS AFTER FINAL DETERMINATION OF OFFICE LOCATIONS.**
SEE NOTE 3150501

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PORTRLAND DISTRICT BUILDING STRONG®

Hydraulic evaluation

Percent flow diversion

- 1.5 inch orifice uses a maximum of 1% of the total serpentine slot flow.

Evaluation of lamprey orifice jet

- Conservative case is at high forebay 76.5 feet.
 - ▶ Max velocity through any one orifice is 6.24 ft/s
- Theoretical stagnant pool max velocity 13.5 feet away is 2 ft/s
- Current conditions in serpentine pools are velocities ranging from 3 – 7 ft/s perpendicular to the lamprey jet.
 - ▶ The cross velocities result in break up of the orifice jet and pushes it upwards away from the next downstream orifice
 - ▶ High confidence that there will be no accumulating transference of momentum between lamprey orifices



Hydraulic evaluation continued

John Day North exit section physical model evaluation of 18" square orifices (2008)

- Larger head drops and orifice velocities of 7.4 ft/s
- Orifices adjacent to side wall did have dye go through multiple orifices
- Moved away from side wall and jet was diffused between orifices
 - ▶ This design is similar to currant lamprey orifice configuration

