MEMORANDUM

TO: Council Members

FROM: Stacy Horton, Washington Policy Analyst/Biologist

SUBJECT: Presentation on Mitigation and Fish Passage by Mid-Columbia Public Utility Districts

BACKGROUND:

Presenters: Peter Graf, Grant Public Utility District Fisheries Scientist, Tom Kahler, Douglas Public Utility District Fisheries Biologist, and Lance Keller, Chelan Public Utility District Senior Fisheries Biologist

Summary: Douglas County Public Utility District, Chelan County Public Utility District, and Grant County Public Utility District, collectively known as the Mid-C PUDs, own and operate five dams on the Columbia River (Wells Dam, Rocky Reach Dam, Rock Island Dam, Priest Rapids Dam, and Wanapum Dam). The Mid-C PUDs work cooperatively with state and federal agencies and tribes to implement salmon protection and mitigation programs. For Douglas and Chelan PUD, these programs were developed with the nation’s first Hydro Power Habitat Conservation Plans. For Grant PUD, the programs are described in the Salmon and Steelhead Settlement Agreement. For all three PUDs, the protection standard is No-Net-Impact, which is unique to the Columbia River and encompasses reservoir and dam survival standards, hatchery mitigation programs, and habitat restoration. In this presentation, the Mid-C PUDs will describe their salmon protection and mitigation programs and how the No-Net-Impact standard is being achieved.
**Relevance:** The Northwest Power and Conservation Council’s *2014/2020 Columbia River Basin Fish and Wildlife Program* calls on hydropower operators of the mid-Columbia Public Utility Districts (PUDs) to implement actions that help manage predator birds, meet Hanford Reach flow measures, evaluate project operations on sturgeon reproductive success in the pools behind FCRPS and Mid-Columbia River dams, and meet specific passage measures and standards identified and agreed to by the operators of the Mid-Columbia PUD projects in FERC licenses and associated agreements.

**More Info:**
Priest Rapids Project Salmon and Steelhead Settlement Agreement (FERC Project No. 2114)  

Habitat Conservation Plans  
Chelan: [https://www.chelanpud.org/environment/habitat-conservation-plans](https://www.chelanpud.org/environment/habitat-conservation-plans)  
Mid-Columbia PUDs
No-Net-Impact Standard

Northwest Power and Conservation Council
February 10, 2021
Habitat Conservation Plans (DPUD, CPUD) & Salmon and Steelhead Settlement Agreement (GPUD)

Collaborative Approach to ESA Protection

• Long-term Agreements (40-50 years)
• No surprises clause (HCPs)
• Unanimous decision-making
• Outcome-based standards
• Adaptive approach and using Best Available Science to achieve **No-Net Impact for Salmon and Steelhead**
No-Net-Impact

Fish Loss
- Hydropower Development/Operation
- Predators Eating Fish

Fish Mitigation
- Preserving/Restoring Habitat
- Fish Hatcheries
- Fish Science
- Predator Management
A Three-Pronged Approach to Reaching No-Net Impact

- 7% Hatchery Production
- 91% Combined Adult/Juvenile Survival
- 93% Juvenile Survival
- 2% Tributary Projects
1. The PUD Smolt Survival Standard:

93% Reservoir and Dam

- The most comprehensive survival standard in the Columbia Basin
- 143 river miles of intensive survival estimates (5 dams, 5 reservoirs)
Best Available Science for Evaluating Survival
Site Specific Studies & Solutions
### Survival Results – Chelan PUD Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Species</th>
<th>Juvenile Survival</th>
<th>Adult Survival</th>
<th>Combined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rock Island</td>
<td>Steelhead</td>
<td>96.75%</td>
<td>99.31%</td>
<td>96.08%</td>
</tr>
<tr>
<td></td>
<td>Spring Chinook</td>
<td>93.75%</td>
<td>99.89%</td>
<td>93.65%</td>
</tr>
<tr>
<td></td>
<td>Sockeye</td>
<td>93.27%</td>
<td>98.37%</td>
<td>91.75%</td>
</tr>
<tr>
<td>Rocky Reach</td>
<td>Steelhead</td>
<td>95.79%</td>
<td>98.93%</td>
<td>94.77%</td>
</tr>
<tr>
<td></td>
<td>Spring Chinook</td>
<td>92.37%</td>
<td>99.90%</td>
<td>92.28%</td>
</tr>
<tr>
<td></td>
<td>Sockeye</td>
<td>93.59%</td>
<td>98.92%</td>
<td>92.58%</td>
</tr>
</tbody>
</table>
## Survival Results – Grant PUD Projects

<table>
<thead>
<tr>
<th>Project</th>
<th>Species</th>
<th>Juvenile Survival (PRD × WAN)</th>
<th>Adult Survival (PRD × WAN)</th>
<th>Combined (82.8% Standard)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wanapum &amp; Priest Rapids Two Projects Combined</td>
<td>Steelhead</td>
<td>87.0%</td>
<td>98.1%</td>
<td><strong>85.3%</strong></td>
</tr>
<tr>
<td></td>
<td>Spring Chinook</td>
<td>86.6%</td>
<td>99.3%</td>
<td><strong>86.0%</strong></td>
</tr>
<tr>
<td></td>
<td>Summer Chinook</td>
<td>83.4%</td>
<td>99.7%</td>
<td><strong>83.2%</strong></td>
</tr>
<tr>
<td></td>
<td>Sockeye</td>
<td>91.7%</td>
<td>91.9%</td>
<td><strong>84.2%</strong></td>
</tr>
</tbody>
</table>
Rocky Reach Dam Juvenile Fish Bypass
Wanapum Dam Juvenile Fish Bypass
Wells Dam: What’s Wrong with this Picture?
Wells Dam Surface Bypass System

Passage Efficiency

- Fish Guidance Efficiency (3-year hydroacoustic study):
  - 92.0% for spring Chinook and steelhead
  - 95.3% sockeye
  - 96.2% subyearling Chinook

- Balloon-tag studies: no measurable injury or mortality through the Bypass System
Bypass-Discharge 2,200 cfs
Wells Project Juvenile Survival Rates

Juvenile Project Survival of at least 93%

– Yearling Spring Migrants:
  • 1998 Chinook  99.7%
  • 1999 Steelhead  94.3%
  • 2000 Steelhead  94.6%
  • 2010 Chinook  96.4%
  • 2020 Chinook  95.17%
  • 5-year average  96.04%

NNI hatchery mitigation set at 3.96% of spring and summer Chinook, coho, and steelhead (7% for other Plan Species)
Unique to the Wells HCP: “The testing shall consider direct, indirect and delayed mortality wherever it may occur and can be measured (as it relates to the project) given available mark-recapture technology.”

No evidence of delayed mortality in the five studies to date!
Because the Wells HCP calculates the hatchery mitigation rate as the average of survival studies on both yearling Chinook and steelhead, DPUD’s yearling summer and spring Chinook, coho, and steelhead NNI. Looks like this...

100% NNI

96.04% Project Survival (Juveniles)

2% Tributary Compensation

3.96% Hatchery Compensation

No Net Impact – Achieved Via the Wells HCP
# Rocky Reach and Rock Island HCPs NNI Hatchery Compensation

<table>
<thead>
<tr>
<th>Species</th>
<th>Basin</th>
<th>Annual Production Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring Chinook</td>
<td>Wenatchee, Methow, Upper Columbia</td>
<td>289,542</td>
</tr>
<tr>
<td>Summer Chinook</td>
<td>Wenatchee, Methow, Upper Columbia</td>
<td>1,155,139</td>
</tr>
<tr>
<td>Steelhead</td>
<td>Wenatchee</td>
<td>247,300</td>
</tr>
<tr>
<td>Sockeye</td>
<td>Skaha</td>
<td>591,050</td>
</tr>
<tr>
<td>Coho</td>
<td>Funding to Yakama Nation</td>
<td></td>
</tr>
</tbody>
</table>
Grant PUD Hatchery Production

✅ District Owned
- Priest Rapids Hatchery
- Nason Creek Acclimation Facility (Nason Creek)
- Carlton Acclimation Facility (Methow River)

✅ Partnerships
- Eastbank Hatchery (Chelan PUD)
- Dryden Pond (Chelan PUD)
- Wells Hatchery (Douglas PUD)
- Methow Hatchery (Douglas PUD)
- Chief Joseph Hatchery (Colville Tribe)
- Omak Creek Acclimation (Colville Tribe)
- Penticton Hatchery (Okanagan Nation)
- Columbia Basin Hatchery (WDFW)
- Marion Drain (Yakama Nation)
- Leavenworth (USFWS)
- Winthrop (USFWS)
**Wells HCP NNI Hatchery Compensation**

**Douglas PUD Hatchery Facilities:**
- Methow Hatchery on the Methow River near Winthrop WA
- Twisp Acclimation Pond, Twisp River (Methow River tributary)
- Wells Hatchery on the Columbia River at Wells Dam

<table>
<thead>
<tr>
<th>Fish Type</th>
<th>Hatchery Location</th>
<th>Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring Chinook (3.96%)</td>
<td>Methow Hatchery</td>
<td>31,169 smolts</td>
</tr>
<tr>
<td></td>
<td>Chief Joseph Hatchery</td>
<td>35,640 smolts</td>
</tr>
<tr>
<td>Steelhead (3.96%)</td>
<td>Wells Hatchery</td>
<td>8,562 smolts</td>
</tr>
<tr>
<td>Summer Chinook (3.96%)</td>
<td>Chief Joseph Hatchery</td>
<td>51,480 yearlings</td>
</tr>
<tr>
<td>Summer Chinook (7%)</td>
<td>Chief Joseph Hatchery</td>
<td>49,000 subyearlings</td>
</tr>
<tr>
<td>Coho (3.96%)</td>
<td>Wells Hatchery</td>
<td>27,720 smolts</td>
</tr>
</tbody>
</table>

**Sockeye (7%)** - CANADIAN FLOW MANAGEMENT (FWMT)
Geographic Extent of Mid-Columbia PUD Programs in British Columbia
FWMT PROGRAM PARTNERS

- British Columbia Ministry of Forests, Lands, Natural Resource Operations and Rural Development
- Syilx Okanagan Nation Alliance
- ESSA
- Fisheries and Oceans Canada
- Douglas County PUD
The FWMT System is a coupled set of biophysical models of key relationships (among climate, water, fish, & property) used to predict the consequences of water mgt. decisions for fish & other water users.

The FWMT may be used to explore impacts of water-management decision in an operational mode employing real-time data, a prospective-mode, or in a retrospective-mode using data from historic water supply, climate, & fish years.
FWMT Mechanics and Data Sources

Adapted from presentation by Brian Symonds, Adaptive Management for Large-scale Water Infrastructure, New Orleans, LA, 26 July 2018
Okanagan (Osoyoos) Sockeye Emergence Timing

The diagram illustrates the emergence timing of Sockeye salmon in the Okanagan River. It shows various stages such as Sockeye eggs, Sockeye alevins, and the emergence of Cohort 1 and Cohort 2. The horizontal axis represents the week ending dates, while the vertical axis shows OK River flow (m³/sec). Different lines and colors indicate actual and forecasted flows, as well as target discharge levels for flood control and other purposes.
Impact of FWMT on Compliance with “Sockeye Friendly” Flow Requirements

Hyatt et al. 2015
Annual Sockeye Counts at Wells Dam, 1977 - 2020

- Wells Dam Sockeye Counts
- Average Count 1977 - 2007
- Average Count 2008 - 2020

Return Year:
- 1977
- 1978
- 1979
- 1980
- 1981
- 1982
- 1983
- 1984
- 1985
- 1986
- 1987
- 1988
- 1989
- 1990
- 1991
- 1992
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- 2013
- 2014
- 2015
- 2016
- 2017
- 2018
- 2019
- 2020

First Returns from FWMT

Count range:
- 0
- 50000
- 100000
- 150000
- 200000
- 250000
- 300000
- 350000
- 400000
- 450000
- 500000
Annual Sockeye Counts at Tumwater and Wells Dams
1977 - 2020

Return Year

- Okanagan
- Wenatchee
Program to Reintroduce Sockeye to Skaha and Okanagan Lakes in British Columbia

- Program shared by Chelan & Grant PUDs and Canadian Partners
  - Okanagan Nation Alliance
  - Department of Fisheries and Oceans Canada
  - BC Provincial Government
- 12-year program to reintroduce sockeye into Skaha Lake
- Habitat Conservation Plans, Hatchery Committees Approved Program in 2010
  - Credit for natural-origin smolts and fry produced from the PUD funded-hatchery
- Penticton Sockeye Hatchery
  - PUDs approved funding in 2011
- Initial stages of reintroduction into Okanagan Lake
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• Capital costs for Penticton Hatchery construction = $4,465,700
• Average annual hatchery operation and program monitoring costs = $547,600
Skaha and Okanagan Lake Sockeye Reintroduction

Hatchery Production Fry Outplants

- Okanagan Outplant
- Osoyoos Outplant
- Skaha Outplant

Number of Fry Released

Broodyear

- 2003
- 2004
- 2005
- 2006
- 2007
- 2008
- 2009
- 2010
- 2011
- 2012
- 2013
- 2014
- 2015
- 2016
- 2017
- 2018
- 2019
Skaha and Okanagan Lakes Sockeye Reintroduction
Future Look
Habitat Funding

✓ Grant PUD contributes annually into three separate accounts for habitat restoration, protection and enhancements projects and to achieve no-net impact.

✓ Priest Rapids Conservation Account - Provides habitat funding for all covered species included in Salmon & Steelhead Settlement Agreement.

✓ BiOp Account - Provides habitat funding for UCR spring Chinook & steelhead.

✓ No-Net-Impact Fund – Provides funding for Project survival shortfalls

✓ A total of 113 projects have been approved by the various committees for funding since 2006.

✓ To date, GPUD has contributed > $43 million to mitigation accounts since Settlement Agreement
Habitat Actions to Increase Osoyoos Natural Production

- Phase II Reconnected Mainstream Habitat Features (2015)
- Phase II Reconnected Side Channel (2013)
- Modified VDS 13 (2013)
- Phase I Reconnected Isolated Oxbows (2009)
- Wetland (Amphibian Ponds) created (2014)
- Phase I Dike Setback & Reactivated Floodplain (2006)
Habitat Actions to Increase Skaha Natural Production
HCP Tributary Conservation Plans

Wells, Rocky Reach, and Rock Island HCP Tributary Conservation Funds (Plan Species Accounts)

• More than $15 million in direct project funding to date
• Leveraged approximately $83 million in project implementation
• Over 100 major enhancement and protection projects implemented since 2004 in the Twisp, Chewuch, Methow, Okanagan (Canada), and Okanogan (US) rivers
Wells Adult Survival Rates

Five-year Average Adult Passage Survival Estimated via PIT-tag conversion rates 2016-2020

- Spring Chinook 99.14%
- Coho 96.52%
- Summer Chinook 97.64%
- Steelhead 99.14%
- Sockeye 99.08%

Includes all sources of mortality or missing detections, not just hydro—substantial inter-dam harvest of summer Chinook and sockeye; substantial straying of coho
Fates of Adult Methow Basin Wild Spring Chinook from BYs 2009-2013 Returning over Bonneville Dam

72 66 66 64 62 62 62 61

BONNEVILLE DAM THE DALLES DAM JOHN DAY DAM MCNARY DAM PRIEST RAPIDS DAM WANAPUM DAM ROCK ISLAND DAM ROCKY REACH DAM WELLS DAM

WENATCHEE R.

62 61 60*

METHOW R. OKANOGAN R.

51* ** 2

UNACCOUNTED FISH BETWEEN BONNEVILLE AND WELLS = 11
UNACCOUNTED FISH DOWNSTREAM OF PRIEST RAPIDS = 10
UNACCOUNTED FISH UPSTREAM OF WELLS = 7

*ACCOUNTS FOR 3 FISH TRAPPED AT ROCKY REACH DAM FOR CHEWUCH HATCHERY PROGRAM (METHOW BASIN)
**ACCOUNTS FOR 6 FISH TRAPPED AT WELLS DAM FOR METHOW HATCHERY

1 FISH STRAYS TO WENATCHEE R.
Survival of Adult Methow Basin Wild Spring Chinook from BYs 2009-2013 Returning over Bonneville Dam
PUD Mitigation Performance and Observations
Hatchery Mitigation: Returning Adults

Return Rate (adult-to-adult survival)

- Wenatchee Spring Chinook: 0.6 Wild, 8 Hatchery
- Methow Spring Chinook: 0.3 Wild, 7 Hatchery
- Okanogan Summer Chinook: 2.3 Wild, 31 Hatchery
- Hanford Reach Fall Chinook: 3.6 Wild, 23 Hatchery
Hatchery Mitigation: Returning Adults

Return Rate (adult-to-adult survival)

- Wild
- Hatchery

Wenatchee Spring Chinook: 0.6
Methow Spring Chinook: 0.3
Okanogan Summer Chinook: 2.3
Hanford Reach Fall Chinook: 3.6

Conservation

Conservation & Harvest

Harvest
Hatchery Mitigation: Contributing to Harvest

Okanogan Summer Chinook

Wenatchee River Summer Chinook

- Broodstock Collected: 1
- Harvested: 9
  - Columbia River non-tribal: 1
  - Tribal: 1
  - Ocean: 1

Hanford Reach Fall Chinook

- Broodstock Collected: 1
- Harvested: 22
  - Columbia River non-tribal: 1
  - Tribal: 1
  - Ocean: 1

Columbia River non-tribal
Tribal
Ocean
Spring Chinook: Survival to Spawning

Cumulative adult survival to spawning

Data from CSS (2019) and ISAB (2018)
Spring Chinook: Survival to Spawning

Cumulative adult survival to spawning

Data from CSS (2019) and ISAB (2018)
Predation: Challenges to Upper Columbia Populations

Sorel et al. 2007

Crozier et al. 2016
Predation: Challenges to Upper Columbia Populations

Moses Lake
Potholes Reservoir
Wanapum Dam
Priest Rapids Dam
Predation: Challenges to Upper Columbia Populations

- More Upper Columbia Steelhead were consumed by avian predators than died from all other mortality sources combined.

- Birds accounted for 42 – 70% of all steelhead mortality from Rock Island to Bonneville Dam.

Collis et al.
Thank you.