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# Fish passage at the Don Sahong dam site, Khone Falls, Mekong River, southern Laos

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# Fish passage at the Don Sahong dam site, Khone Falls, Mekong River, southern Laos



**12 December 2018**

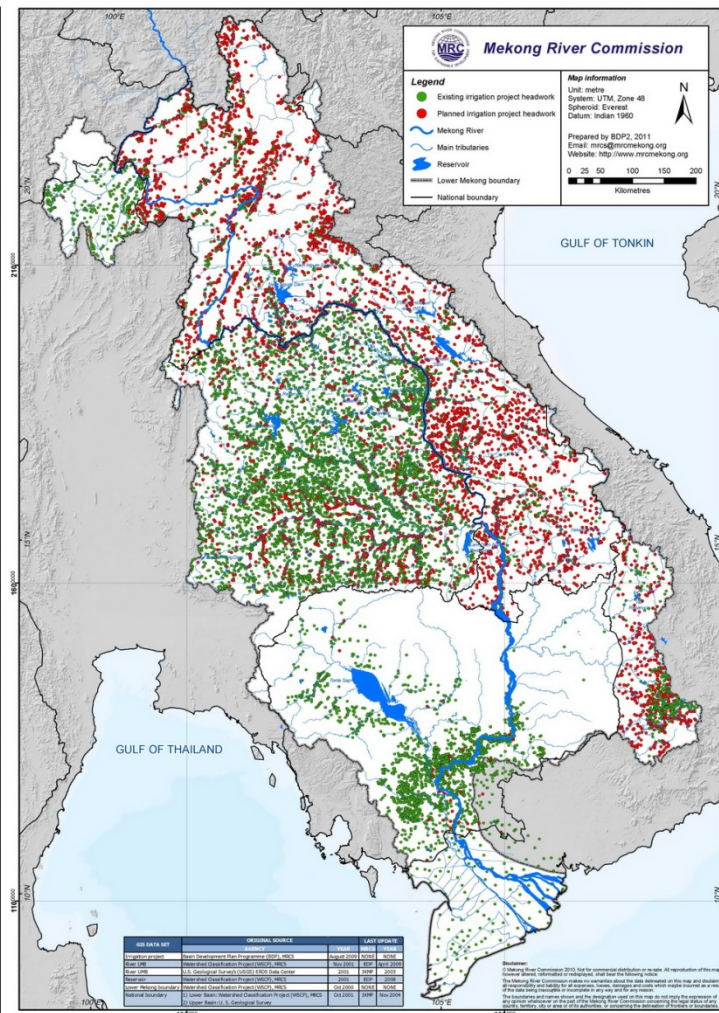
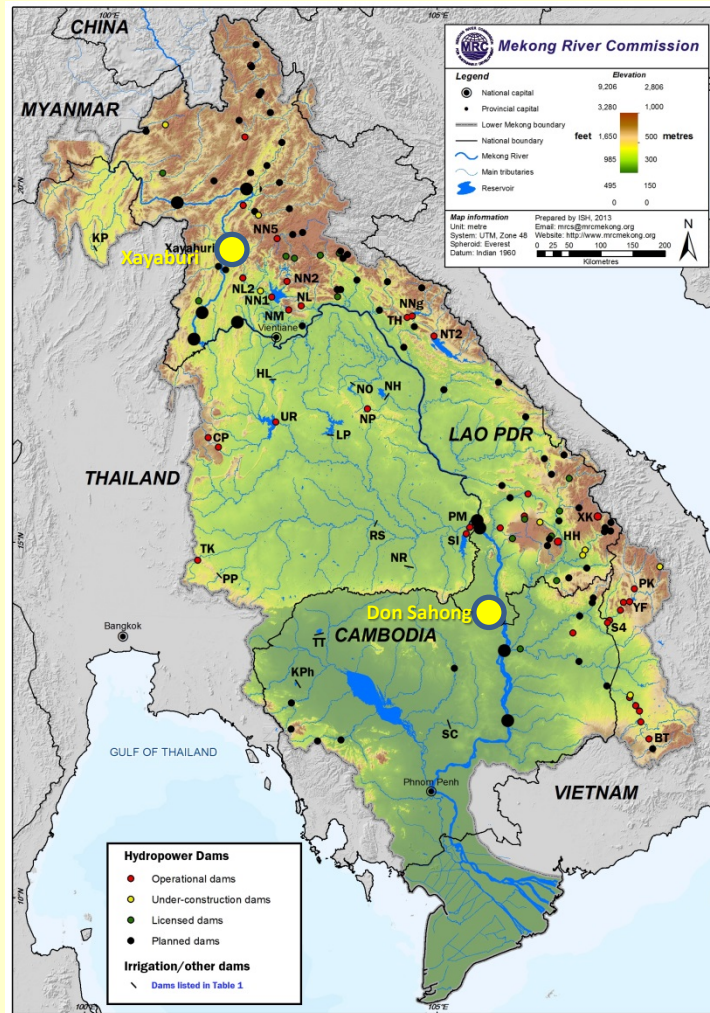
Kent Hortle & Somphone Phommanivong  
Don Sahong Power Company, Vientiane

**dshpp.com**

# Contents

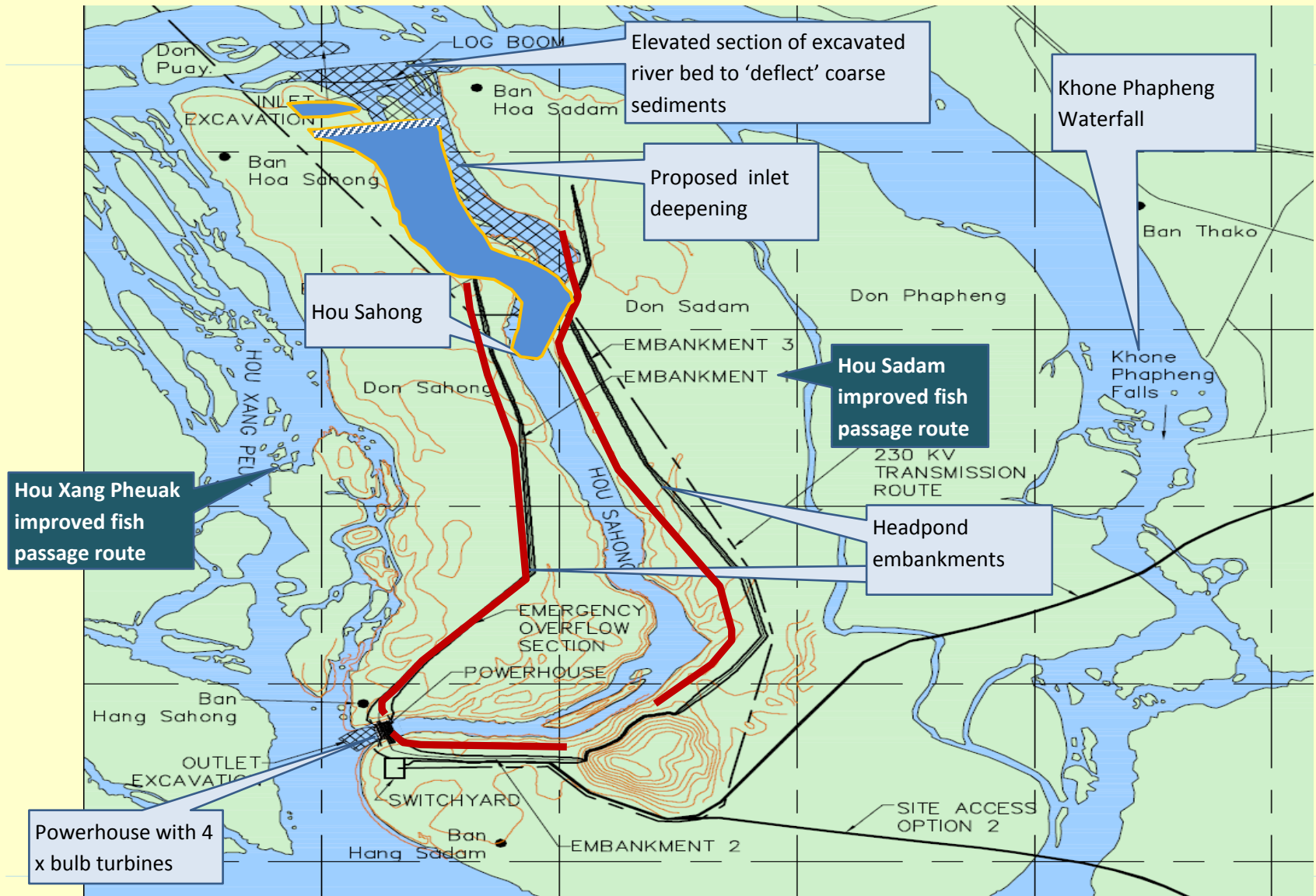
- 1. Don Sahong Hydropower Project (DSHP) brief description.**
- 2. Site characteristics.**
- 3. Fish migrations, fishing.**
- 4. Mitigation & management approach.**

# Mekong Basin dam projects



- 88 HP dams in LMB by 2017, 20 in China and 1000s of other dams.
- 11 Mekong mainstream projects in LMB, 2 under construction.
- Maps from Hortle & So (2017)

# Main Features



# Don Sahong Hydropower Project (DSHP)

- Construction - January 2016 to mid-2019.
- Impact area of 4.6 km<sup>2</sup>
- **Small reservoir = 2.8 km<sup>2</sup>. e.g. Nam Ngum Res. is 470 km<sup>2</sup>.**
- Live storage = 0.021 km<sup>3</sup>, cf. all Mekong reservoirs = 46 km<sup>3</sup>. Don Sahong = ~1/2200 of all live storage.
- Capacity 260 MW, Dam 25 m high, Operating head 16-18 m.
- **Discharge 1600 m<sup>3</sup>/s, 17% of mean annual flow .**
- **Horizontal bulb turbines, 4 blades, GE (Alstom), 7.2 m dia., 83.3 rpm.**
- DSHP effects on Mekong flows and sediment transport are not regionally significant.
- **Fish and fisheries are very important regionally, and the dam will block one Mekong channel.**

# MRC PNPCA report 2014

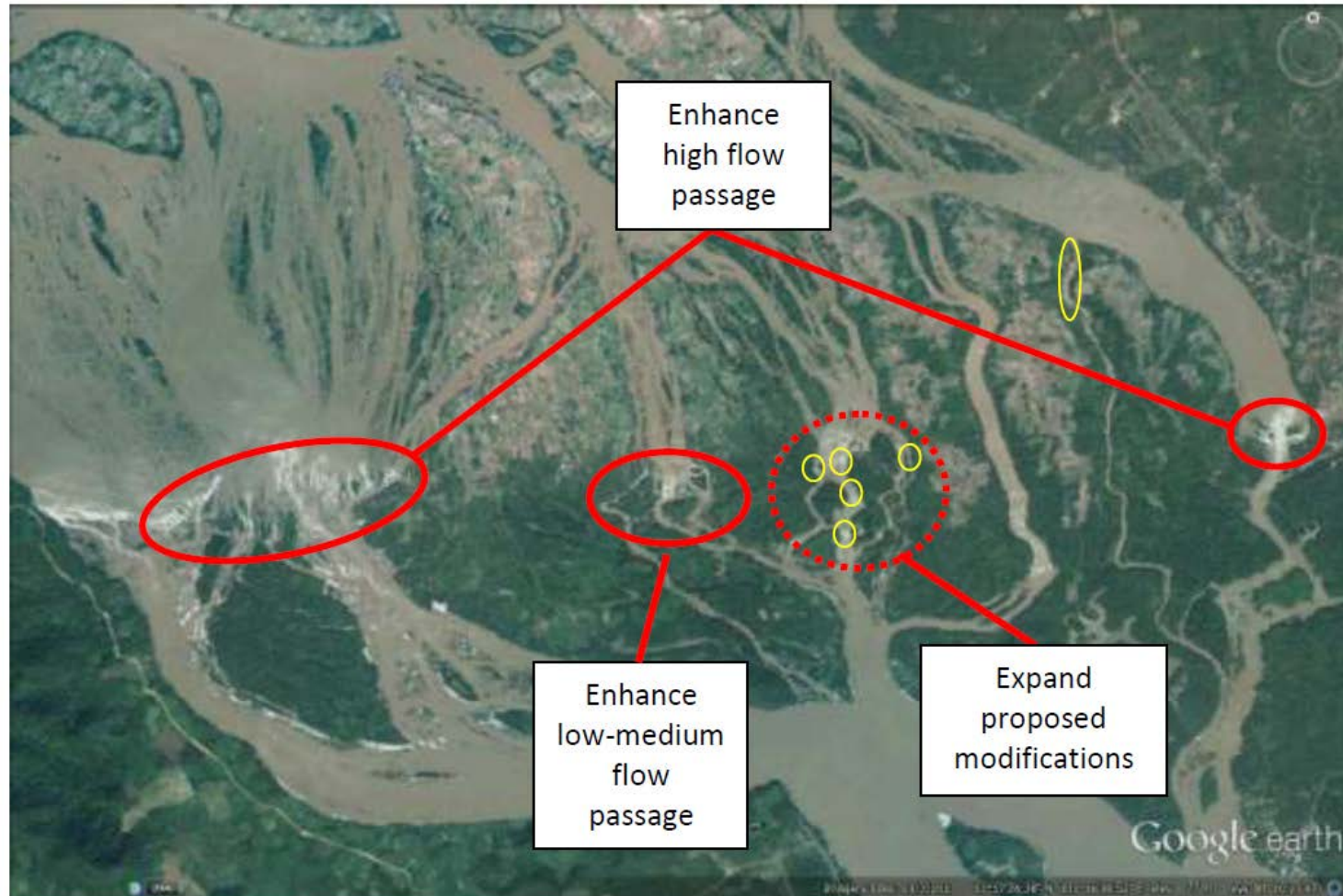
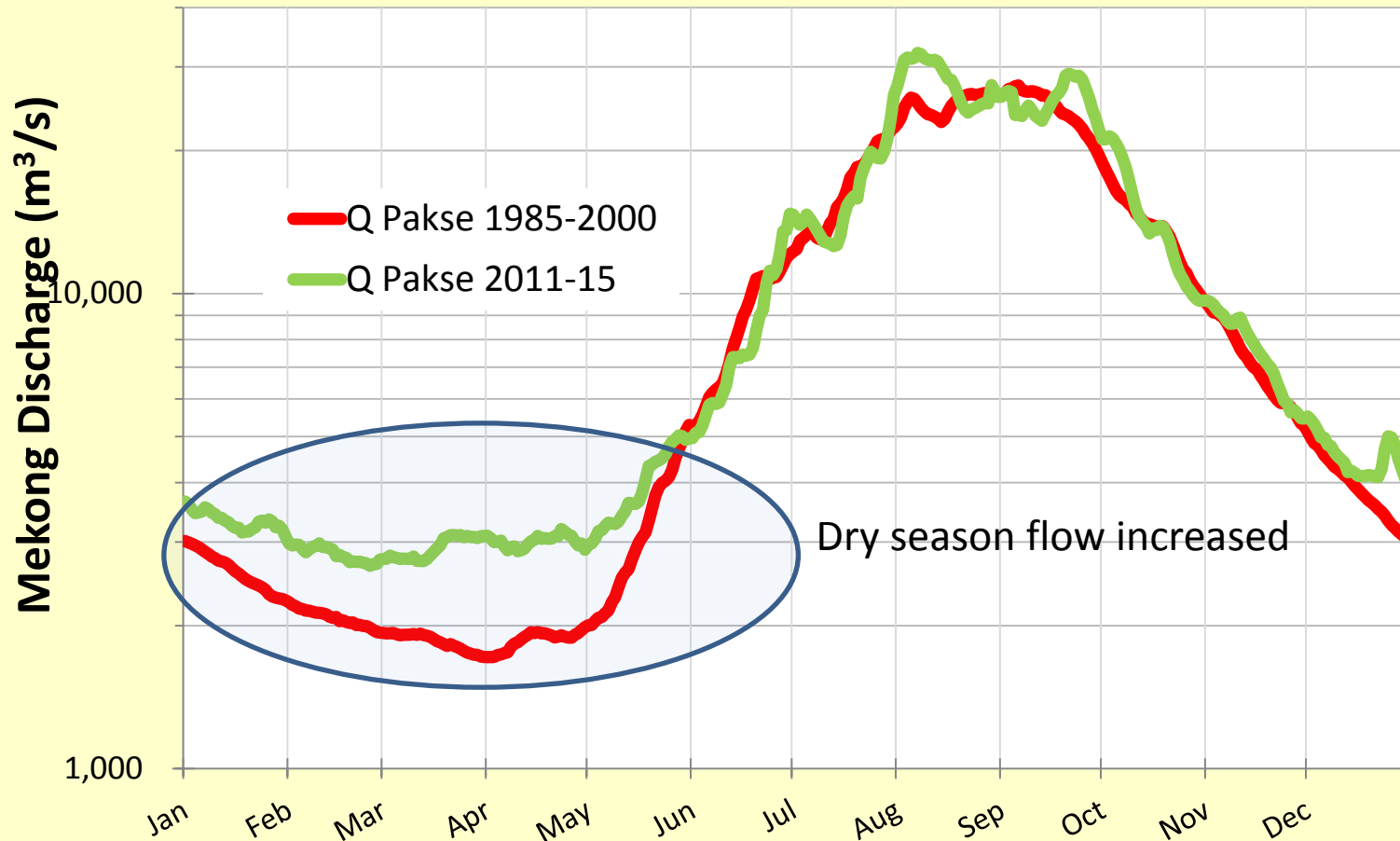


Figure 4. Options for expanding fish passage at Khone Falls to compensate for lost dry season and wet season fish passage in Hou Sahong. Yellow is existing and proposed by developer, red is recommended for investigation by EG.

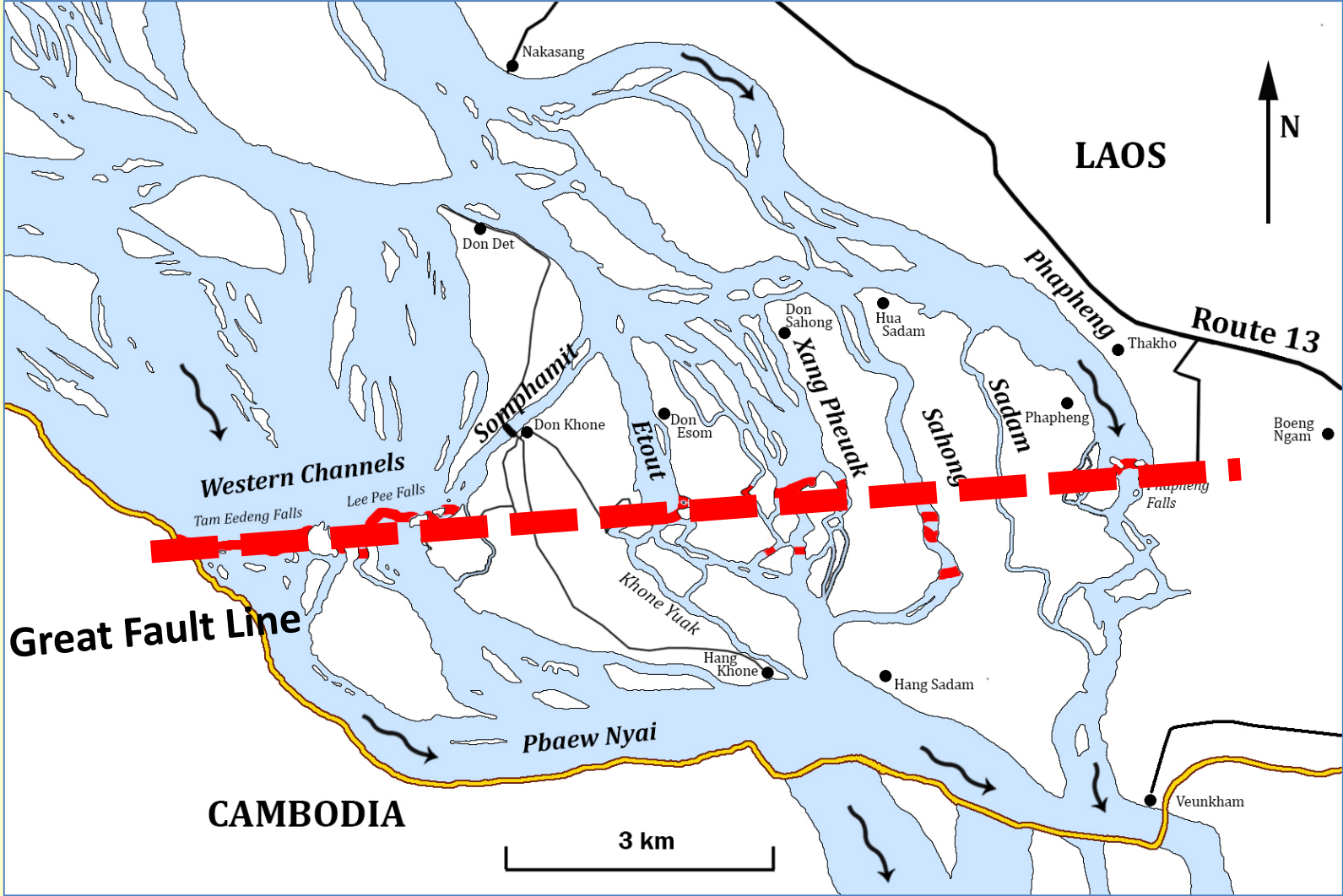
# Average daily flows at Khone Falls 1985-2000 vs. 2011-2015



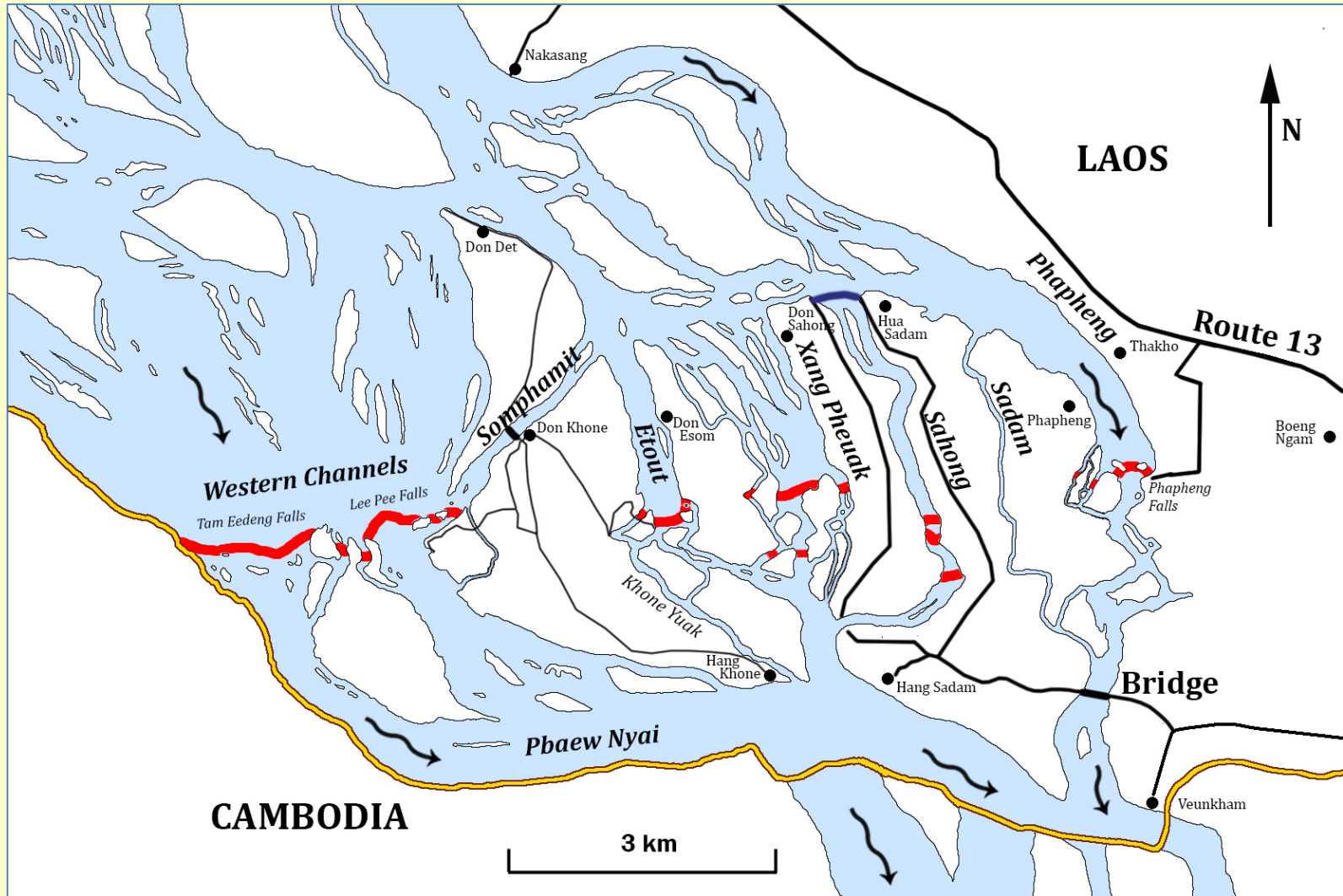
- Fish passage enhanced by dry season flows
- Reduces fishing efficiency



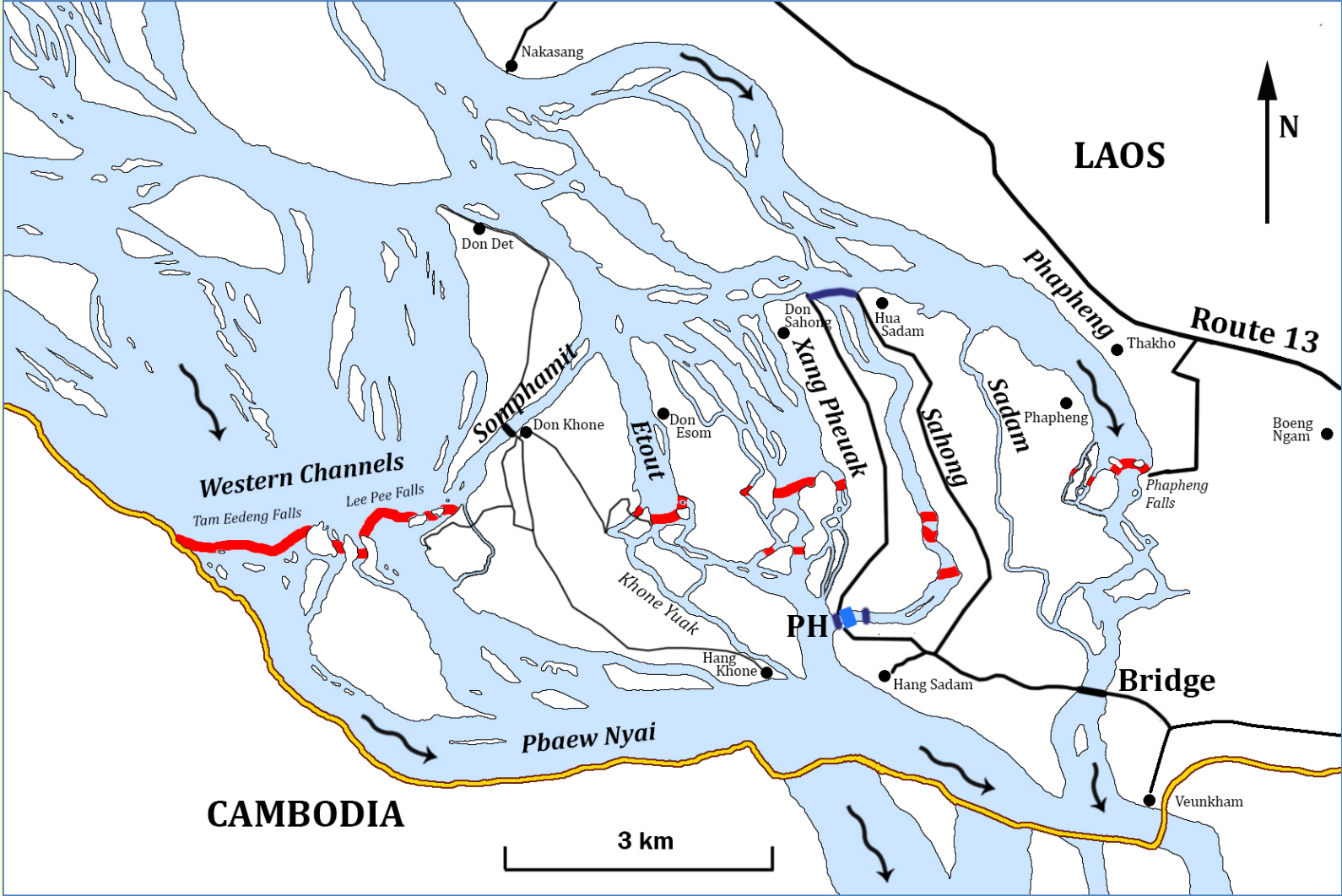
# Khone Falls channels, baseline 2015



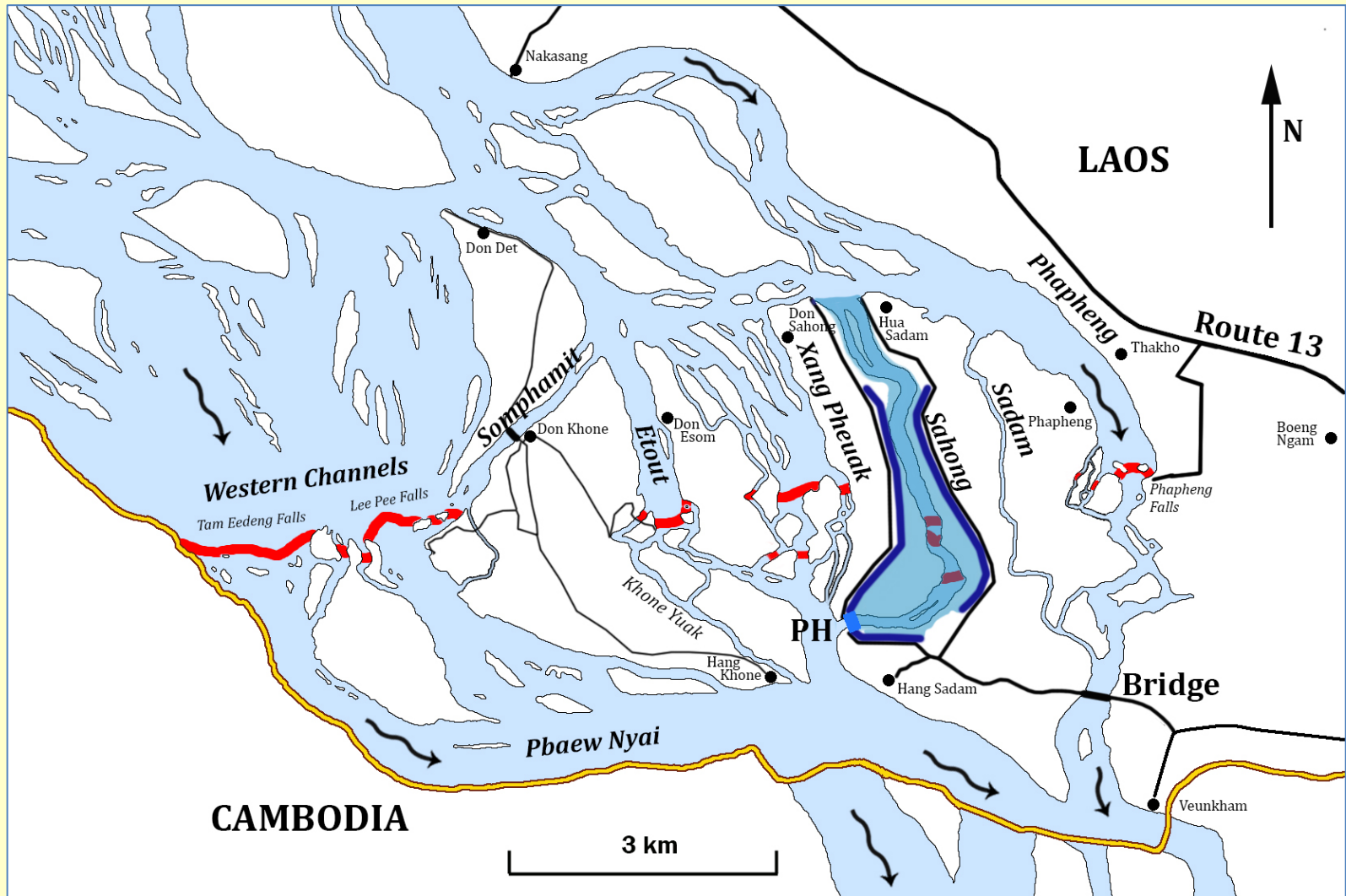
# DSHP Construction 2016



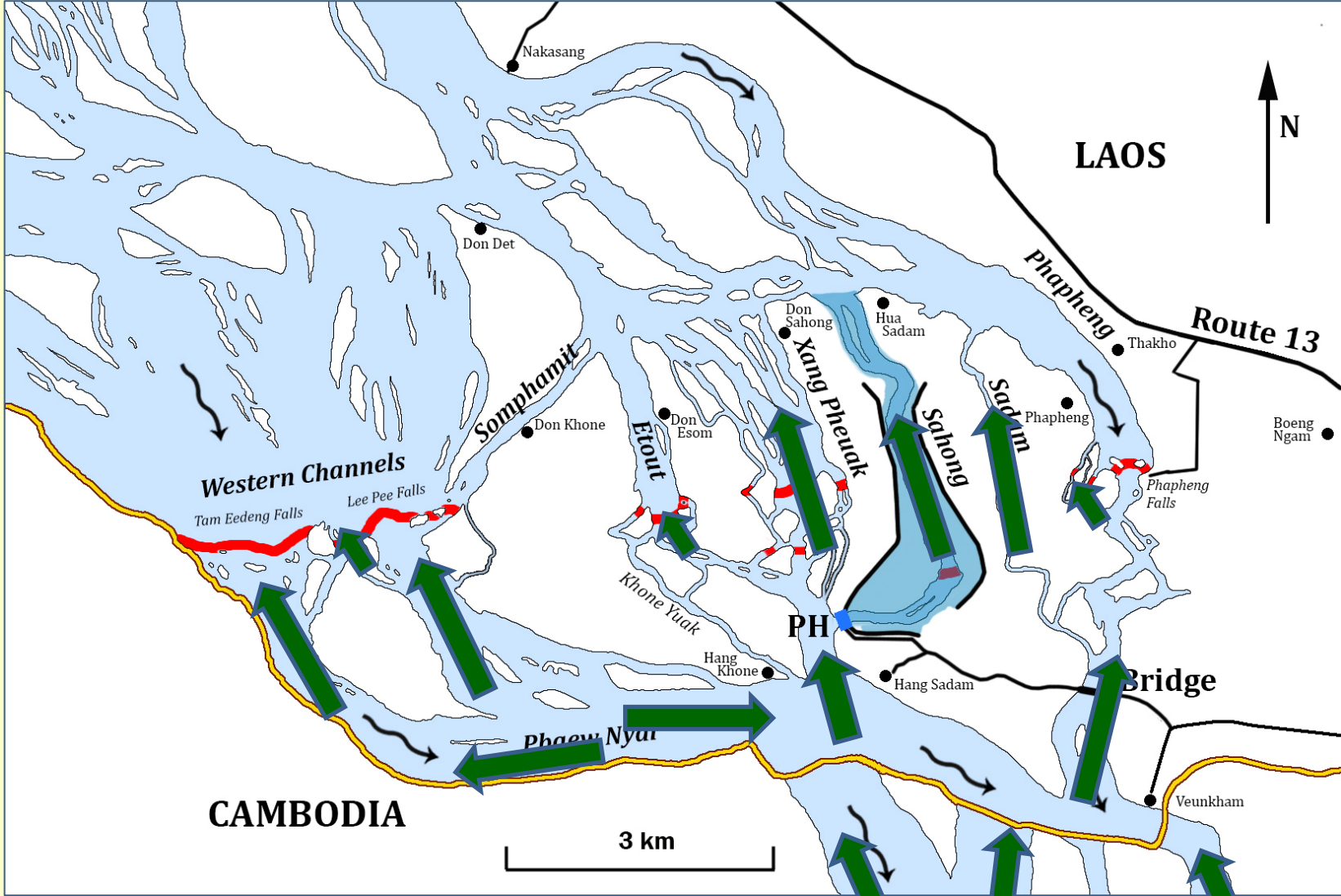
# DSHP Construction 2016-2019



# DSHP operations 2019-



# Fish migrate into all channels



# Somphamit Falls 17 Feb 16



- Part of western falls, 2<sup>nd</sup> most popular tourist site
- Most fish cannot pass most of the cascades

# Somphamit Falls 31 July 18



- Falls are drowned out completely across 3 km of river.
- Fish can likely pass in many places; but difficult to study.
- Upstream fish passage is mainly a low-flow issue.

# Khone Phapheng Falls, 18 March 2016



- **Most popular tourist attraction**
- **Only small side channels passable in the dry season.**
- **Traps blocked channels until 2016**



# Khone Phapheng Falls, 2 Aug 2018



- **‘Drown-out’ of barriers, fish passage easier in the wet season**

# Dam site in 2010 looking down Sahong Channel



# Illegal gears block migrations in Sahong Channel May 2013

12 Lee traps  
below the  
Tat Pho rapid



Main obstruction  
for upstream migration at Taat Pho

# Upstream coffer dam Sahong Channel, May 2016



- Closed 5-15 Jan 2016 by temporary coffer dam

# Don Sahong Dam Site, July 2016



- Xang Pheuak Channel is on the left

# Approach for upstream fish passage improvements

## **Reduce fishing pressure (DSFMC)**

- Large illegal fishing gears removed by GoL in 2016.
- Ongoing enforcement of the law, especially destructive fishing.
- Provide alternative livelihoods for fishers.

## **Physical improvements (DSPC)**

- 1) Increase water flow through channels.
- 2) Remove or flatten barriers.
- 3) Go around barriers (bypass).

# Sadam Channel, 26 May 2006



- Channel blocked by fences with traps
- Removed in 2013 during FP works, and again in 2016

# Sadam Channel blocked in dry season 2013



- One of several fences across the channel



# Lee Traps in Xang Pheuak Channel



**29 Jan 14**

**17 Aug 14**



# Lee Trap in Sahong Channel, 17 June 2014



Sahong Lee.mp4



L LK Lop fish.mp4

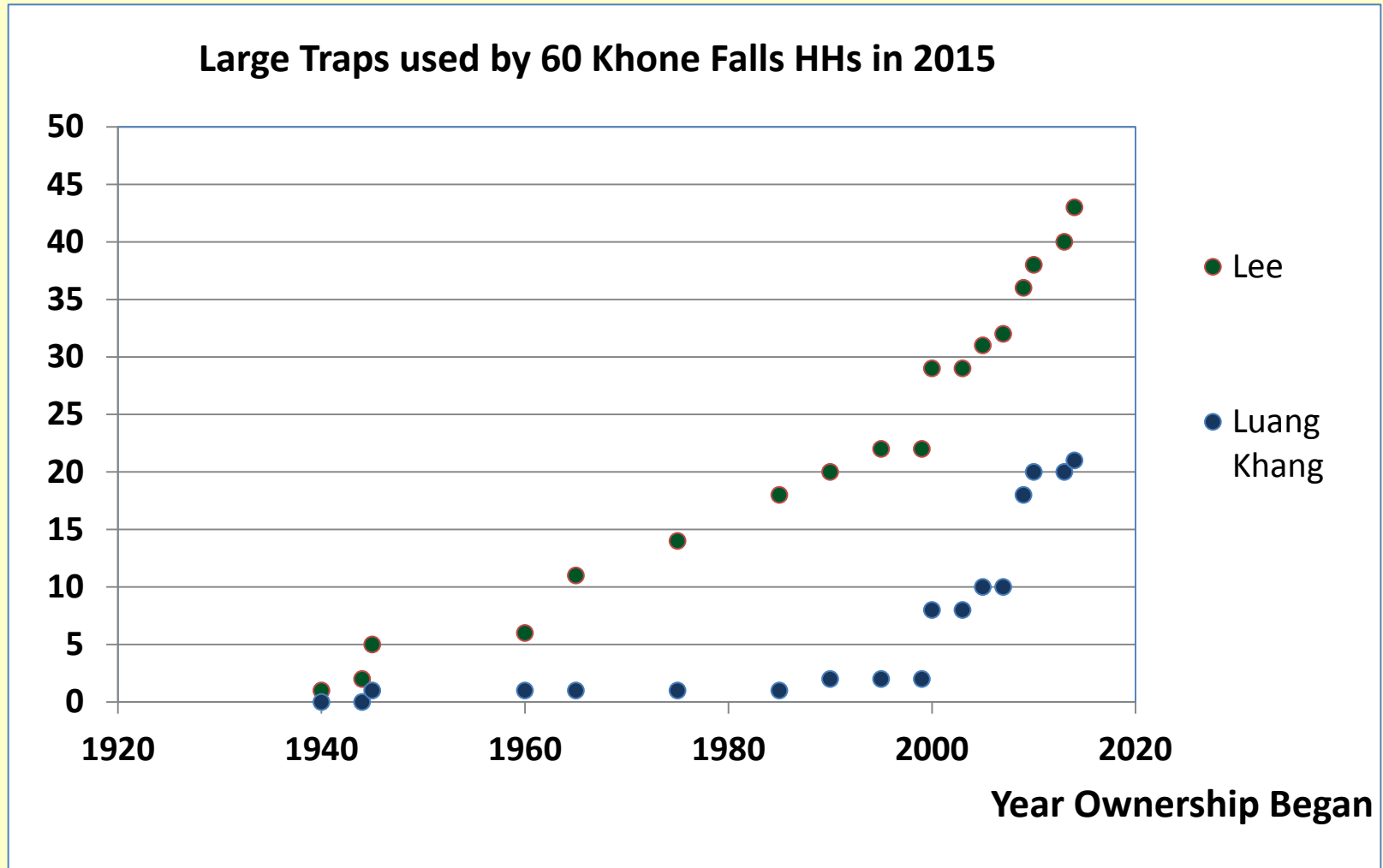


# More traps and getting bigger each year



- Don Sahong May 2015 – very large luang khang traps
- Traps have become larger as chain saws and other tools more available.

# Increasing use of big gears at Khone Falls



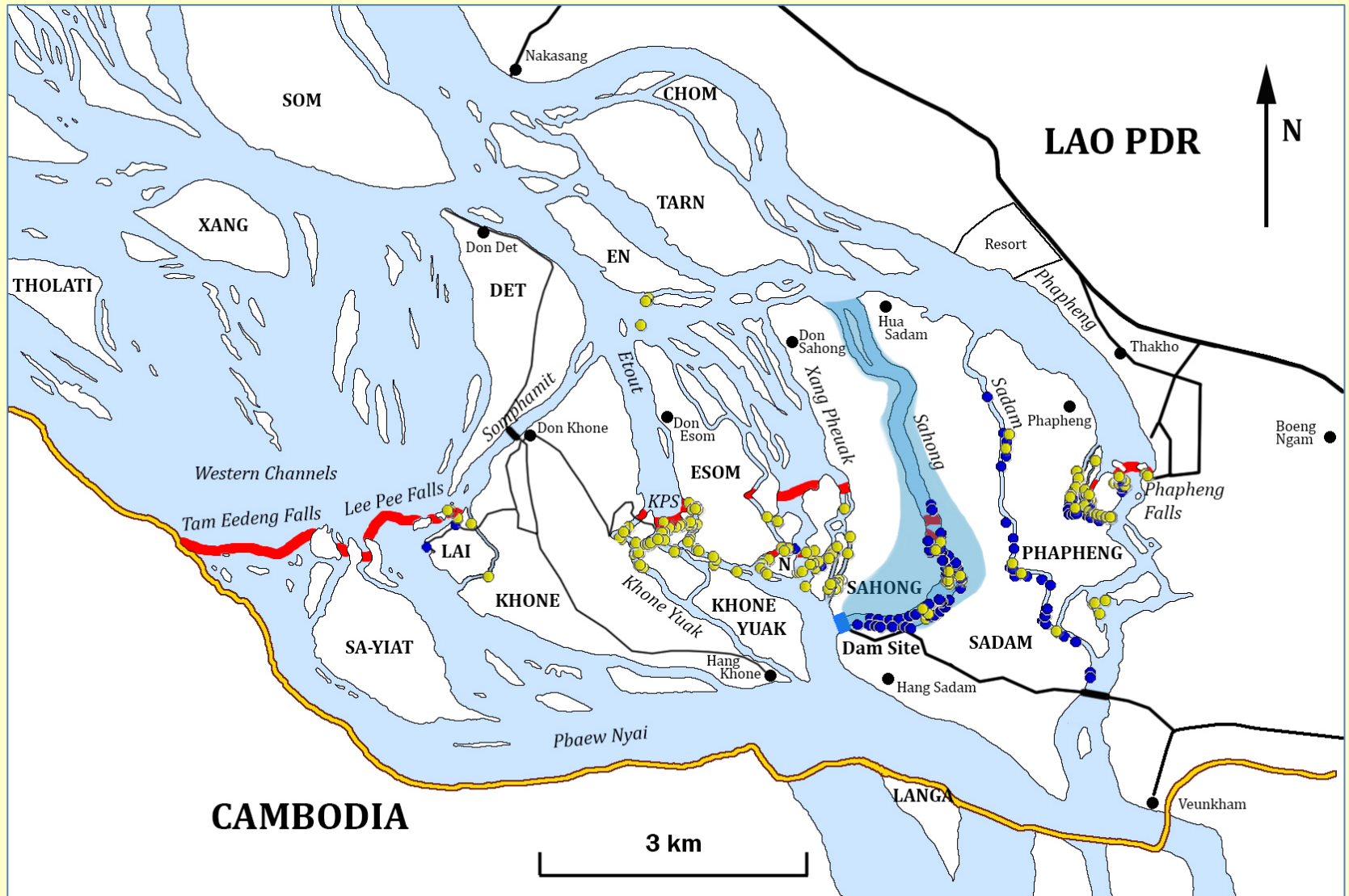
# Giant Catfish (protected), from *lee*, Etout, July 2014



# *Pa beuk* are eaten on site



# Big Gears in July 2015, all removed June 2016



# Approach to fish passage improvement works

1. Identify barriers and flow issues
2. Hydraulic modelling for larger works
3. Planning, hiring and approvals
4. Dry-season window identification
5. Works during dry season each year

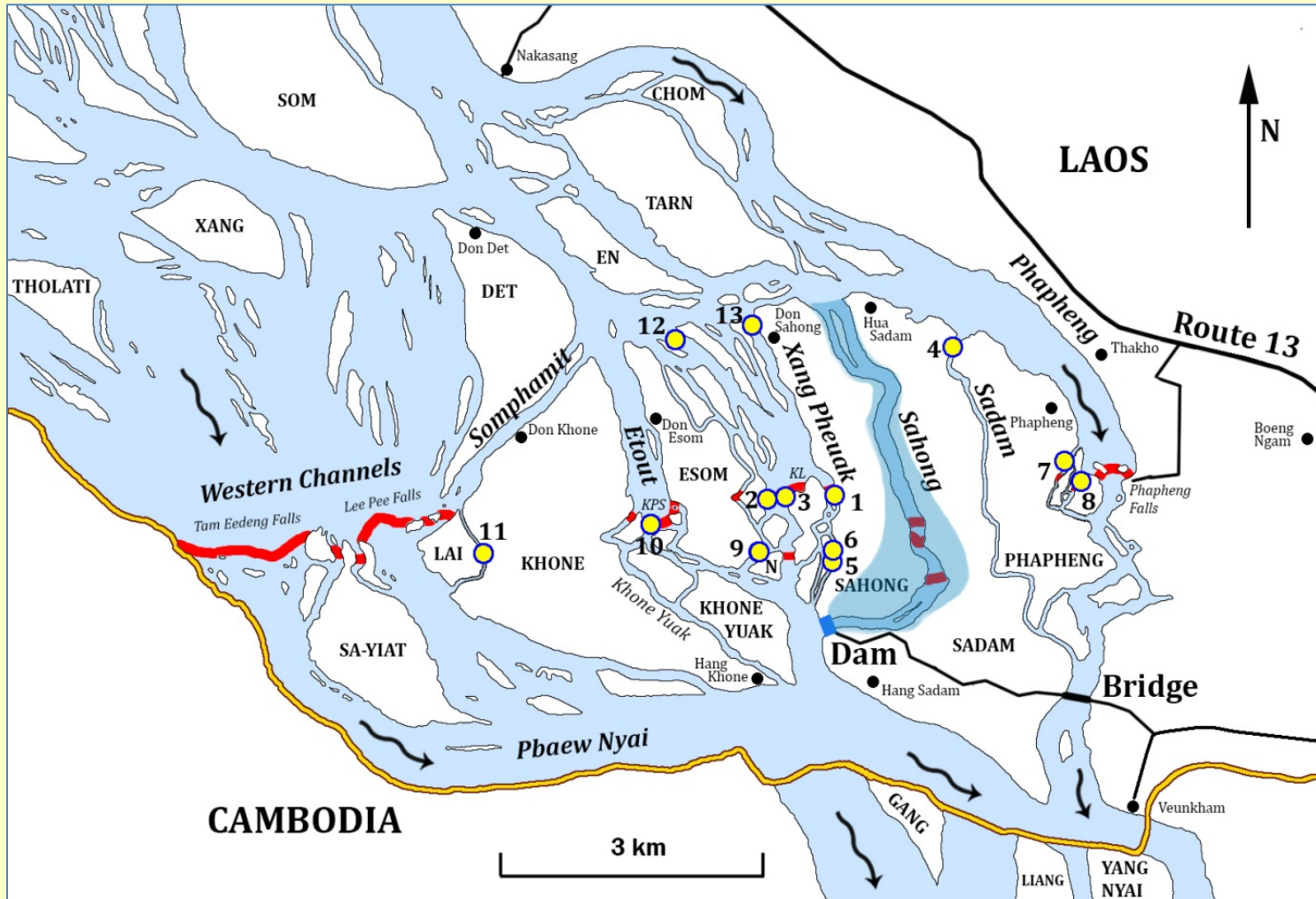
- 1) Deepening to increase flow
- 2) Flattening barriers
- 3) Bypass channels



# Fish passage sites



Cleaning.mp4



- Sites 1-8 already modified. Sites 9-13 planned.

# Most work is done by fishers with hand tools



# Temporary levees, gears burnt to heat and crack rock. Sompordan Channel in April 2016



# Blasting and machinery for larger works



# Xang Pheuak Channel, 26 April 2016



- Bypass fish passage test opened after 4 months work

# Xang Pheuak Channel, 29 June 2016



Early wet season flows drown out barriers.

# Xang Pheuak Channel, 26 April 2016



- A significant barrier in this channel

# Xang Pheuak Channel, 29 June 2016



- Early wet season, barriers drowned out



# Success of fish passage works directly observable



- Hou Wai re-opened on 3 May 2016, fish migrated through the channel in large numbers around 20 May 2016.

## 24 May 2016, Ban Hat - 22 km upstream of Hou Wai



- About 200 boats fishing the migration, > 2 tonnes per day

# Processing fish at Ban Hat



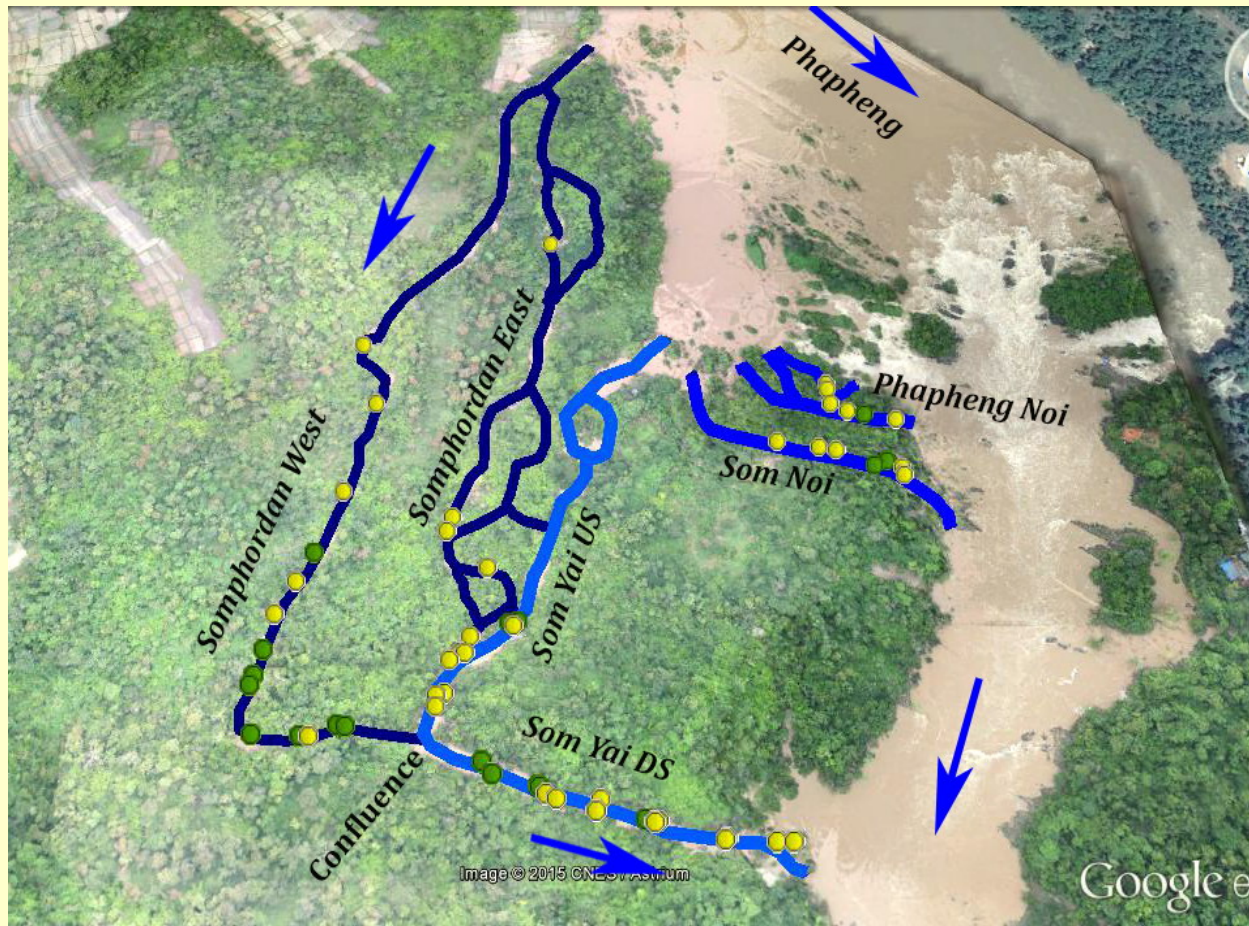
18 July 2018 Pakse 150 km US of Khone Falls  
*Pangasius sanitwongsei*, 125 kg, Gill Net



23 July 2018 Thakhek, 400 km US of Khone Falls  
*Pangasianodon gigas*, 120 kg



# Hou Som Yai works in 2017



- Planning is based on surveys and modelling.
- Access and approvals are significant issues.
- Limited window during each dry season for works.

# Traps block Hou Som Yai in 2015



# Traps removed in 2016



- By 2017 – some rebuilding



## Hou Som Yai barrier...concreted in 2000



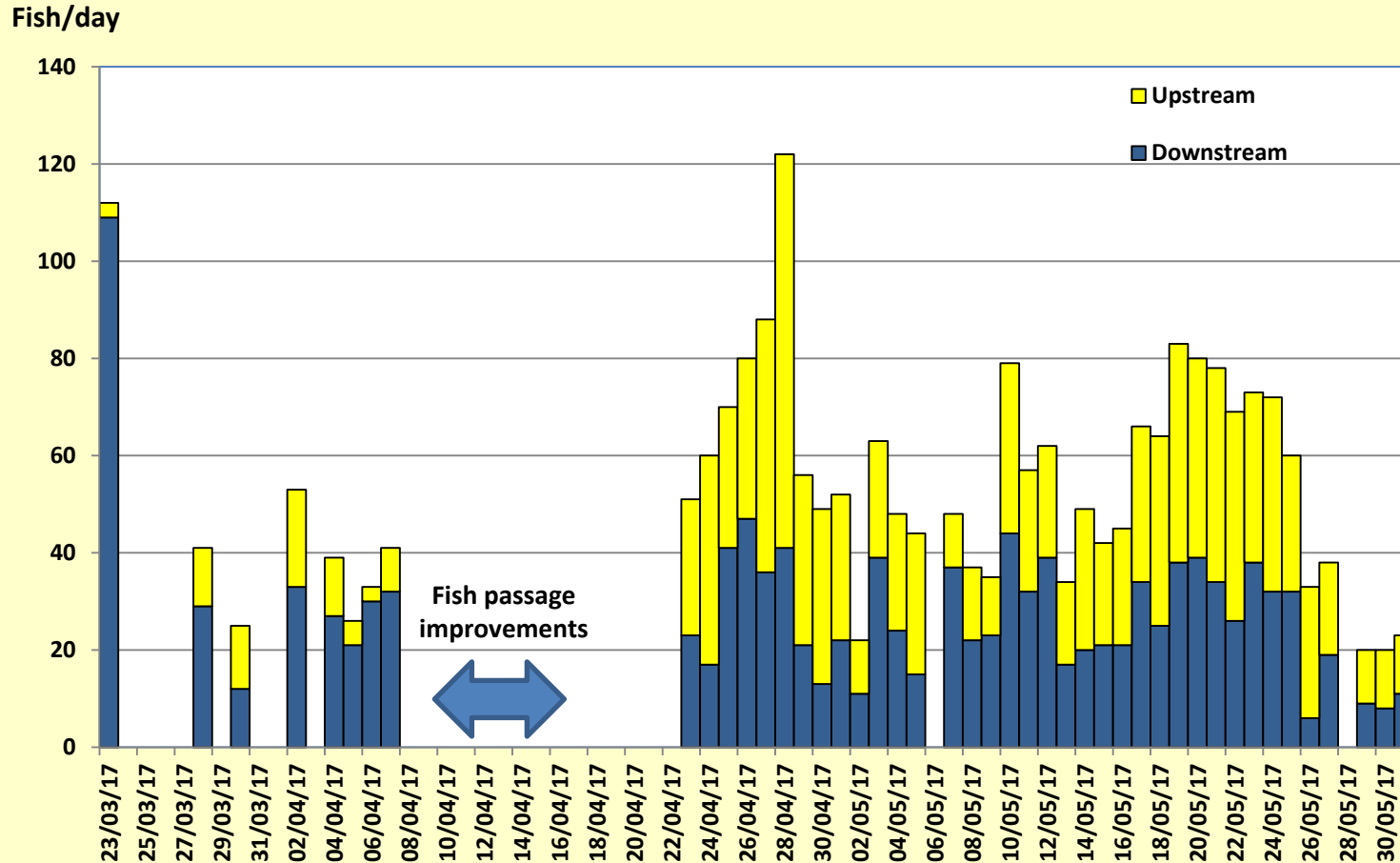
- Blocked all fish, which were then caught by lee traps.

## Hou Som Yai barrier reduced in April 2017



- Fish pass upstream, but some accumulation of fish at low flows

## Hou Som Yai Channel, 2017 daily fish catch by standardised cast netting 2,442 fish, 35 species

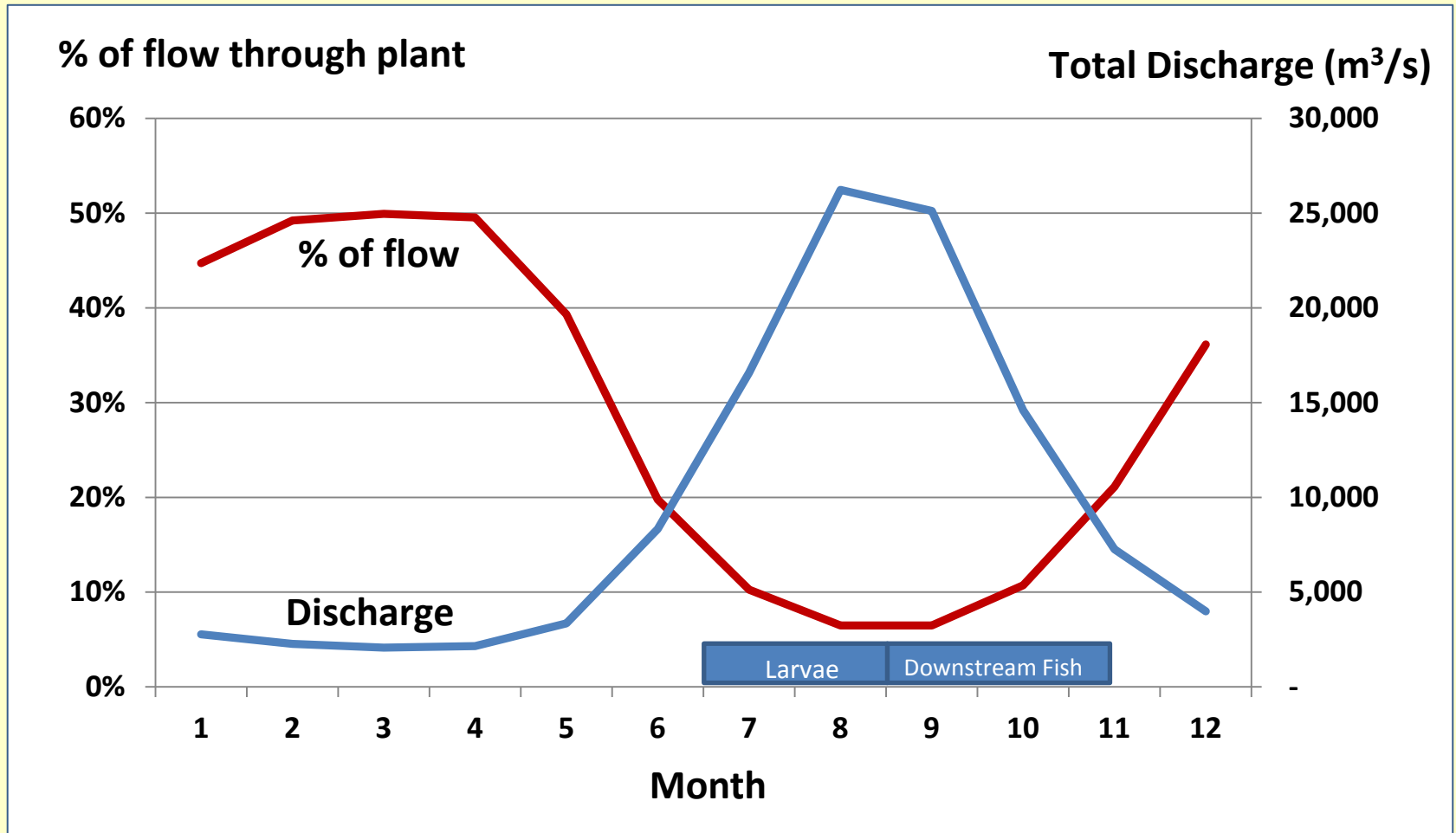


- Fish moved upstream in large numbers after barriers reduced.
- Some accumulation of fish at barriers.
- More works planned in 2019 dry season.

# Summary

- DSHP construction 2016-2019, Sahong Channel closed Jan. 2016.
- DSHP differs from other Mekong hydropower projects, blocks one of seven anabranch channels at Khone Falls.
- About 83% of total Mekong discharge will bypass the dam, providing opportunities for fish passage in six other channel systems.
- Fish passage is being improved by physical works in channels and by eliminating barrier gears from channels.
- Destruction of big gears by GoL in 2016 reduced blockage of channels for migrating fish but caused some loss of catches at Khone Falls.
- Fish passage improvements already done at 8 sites and more are planned, ongoing for 10 years.
- Downstream fish passage will be mainly via other channels. Bulb turbines are relatively fish-friendly. Monitoring will direct further mitigation work.

# Total Mekong Discharge and % flow through the DSHP turbines



- Flow through DSHP plant will be low at times of most downstream migrations.