

Don Sahong Hydropower Project



Purpose of Presentation

- Follow-up to November 2013 presentation and site visit
- To look at the conditions in the dry season
- Information previously presented is summarized only
- Respond to the questions raised in November 2013

Overview

- Outline of main scheme features
- Engineering
 - Hydrology
 - Sedimentation
 - Construction effects
- Environmental studies and fish migration pathways
 - Design and development of fish migration pathways
 - Monitoring of performance of the pathways

Main Scheme Features



Mekong
River

Hou Sahong
headpond

Khone
Phapheng
Falls

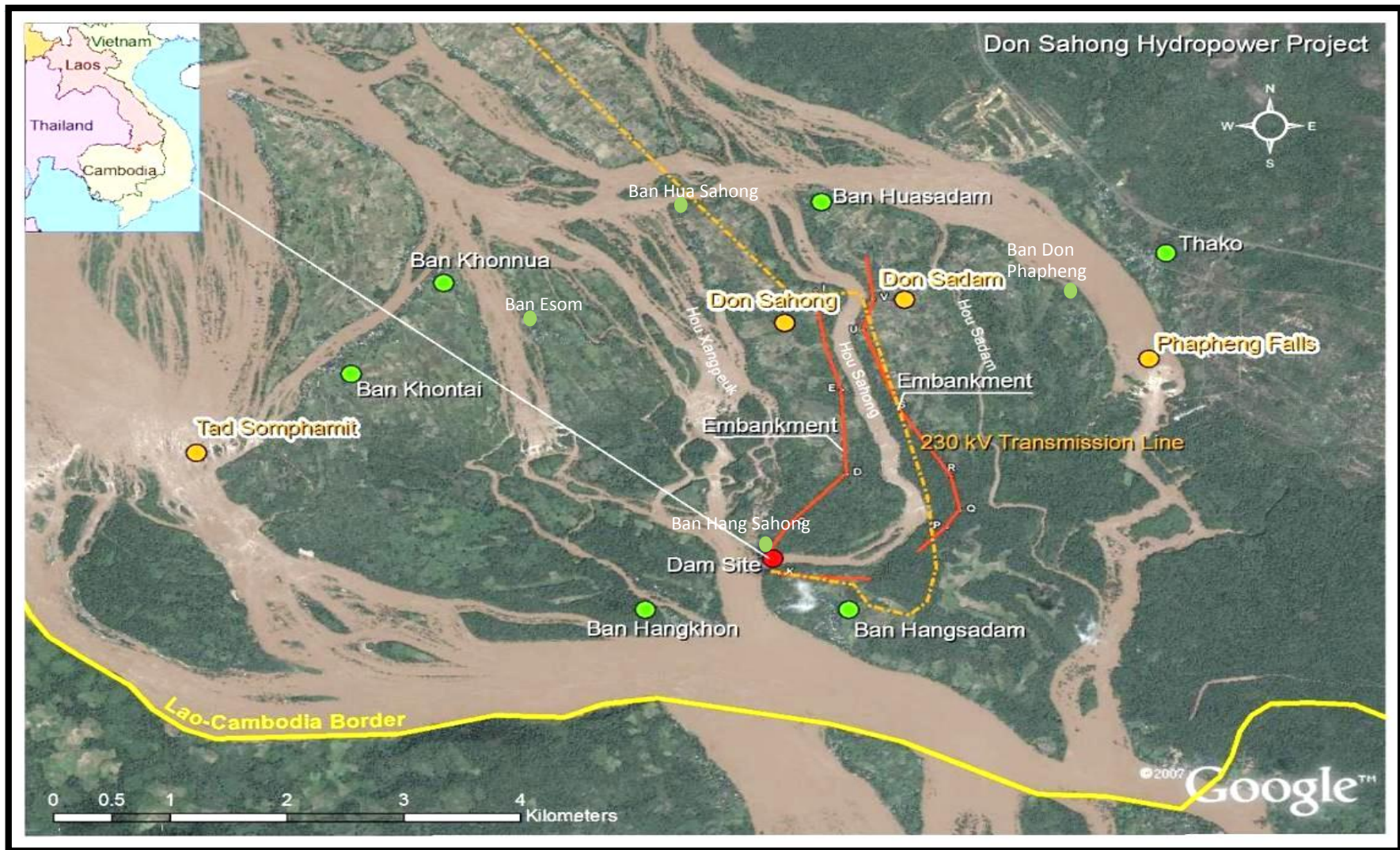
Don Sahong
Power Station

11/03/14

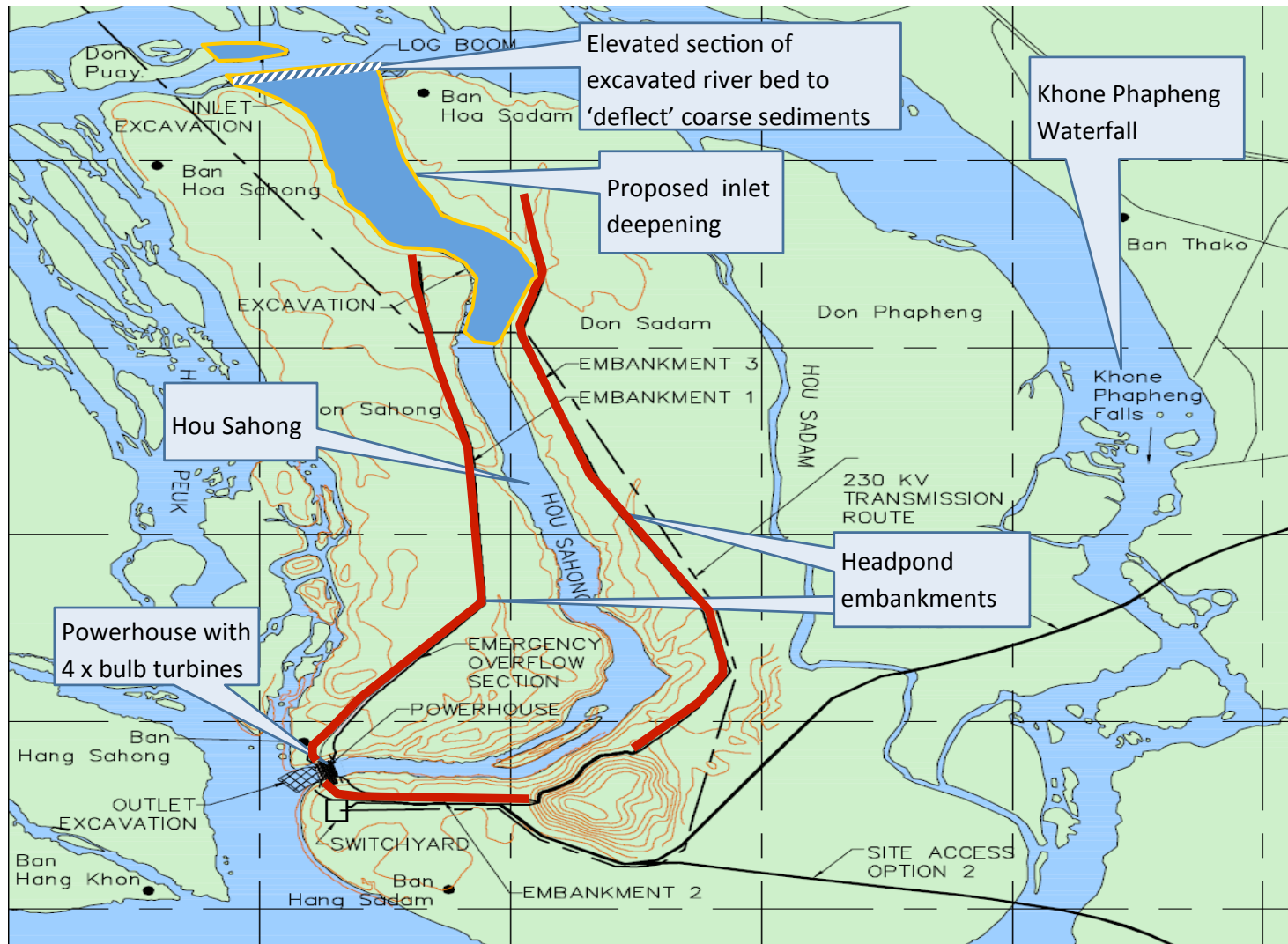
Don Sahong Power Company

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Location



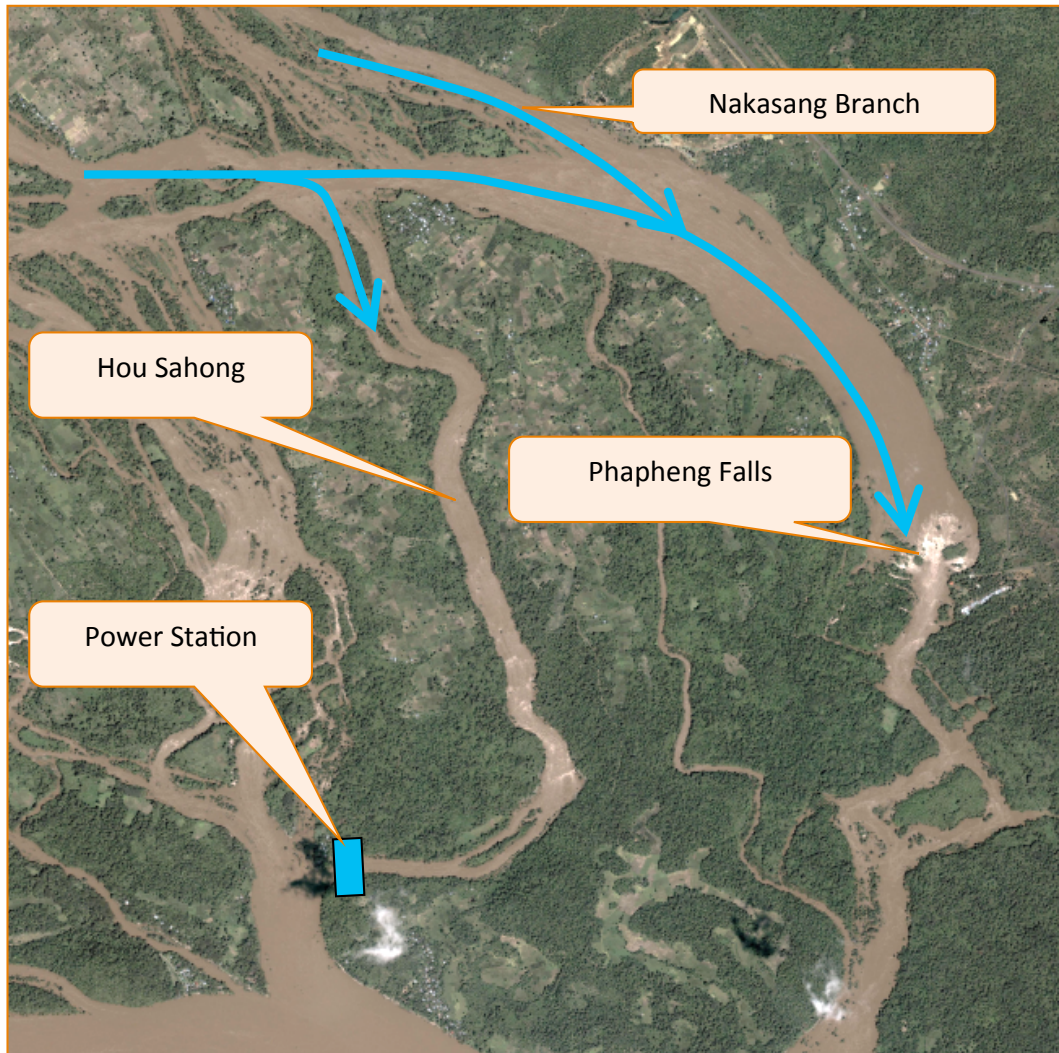
Main Features



Main Features

- Design flow of 1600 m³/s
- Run of river operation
 - No significant active storage
 - Generation must follow river flow and water level variations
 - All flow entering the Hou Sahong is discharged through the powerhouse turbines
 - There are no hydraulic control structures required at the inlet
- Minimum flow of 800 m³/s over Khone Phapheng Falls

Control of Flows with DSHP

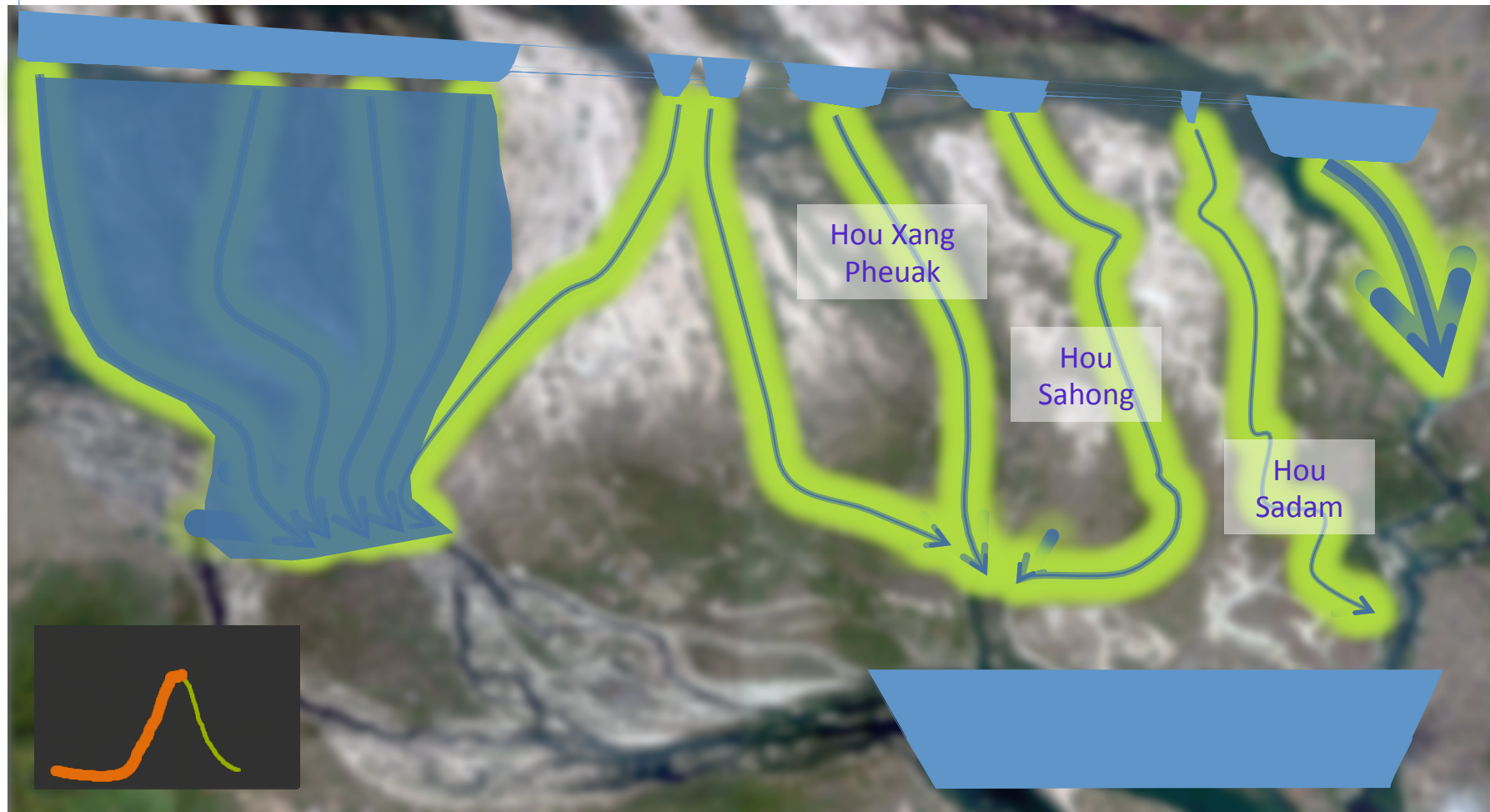


- Flow over the waterfall will always be available as water continues past Hou Sahong inlet and Nakasang Branch
- Minimum flow of 800 m³/s over Phapheng Falls is **first priority**
- Power station turbines are used to control flow and maintain water flow to the waterfall

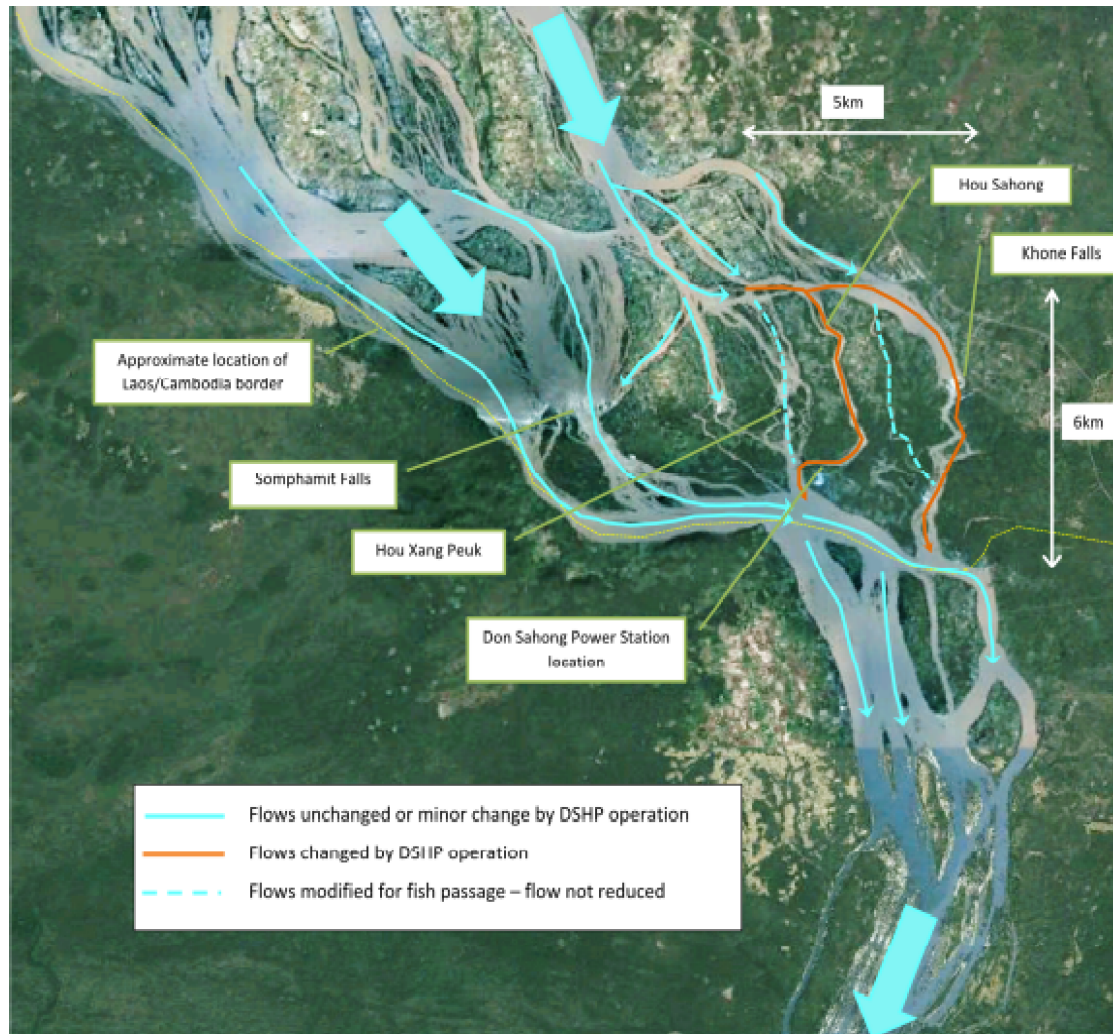
Hydrology – Overview

- Brief overview of hydrology
 - Seasonal flow variations across the ‘Great Fault’
 - Flow distribution with Don Sahong operating
 - Flow changes - Hou Sadam and Hou Xang Pheuak
- Main discussion on hydrology is on how it relates to fishery aspects

Hydrology - Seasonal Flow Distribution for the various main channels



Flow Distribution in Different Channels

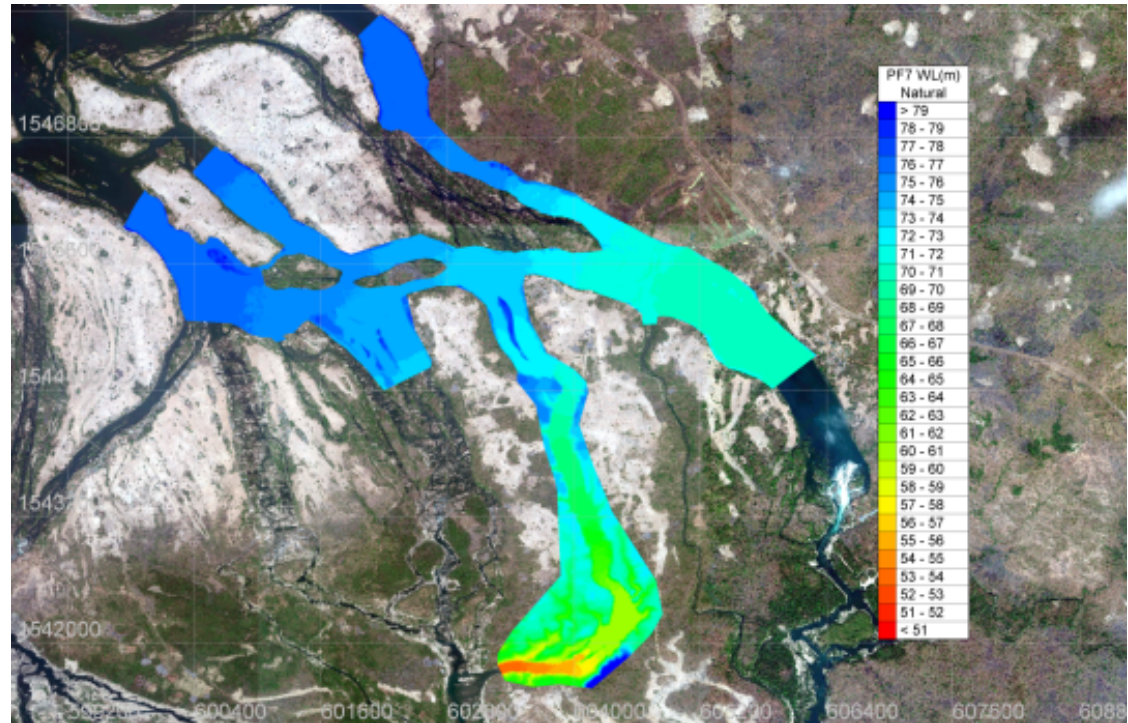


- Flow distribution will vary for Hou Sahong and at Phapheng Falls
- Hou Xang Pheuak and Hou Sadam changes defined by fish passage works to ensure no reduction from present flow regime
- Flows upstream of Hou Sahong inlet not affected
- North branch and Ban Nakasang not affected
- Somphamit Falls and Don Det not affected
- No effect on downstream after flows recombining

Hydrology – Modelling & Water Level Changes

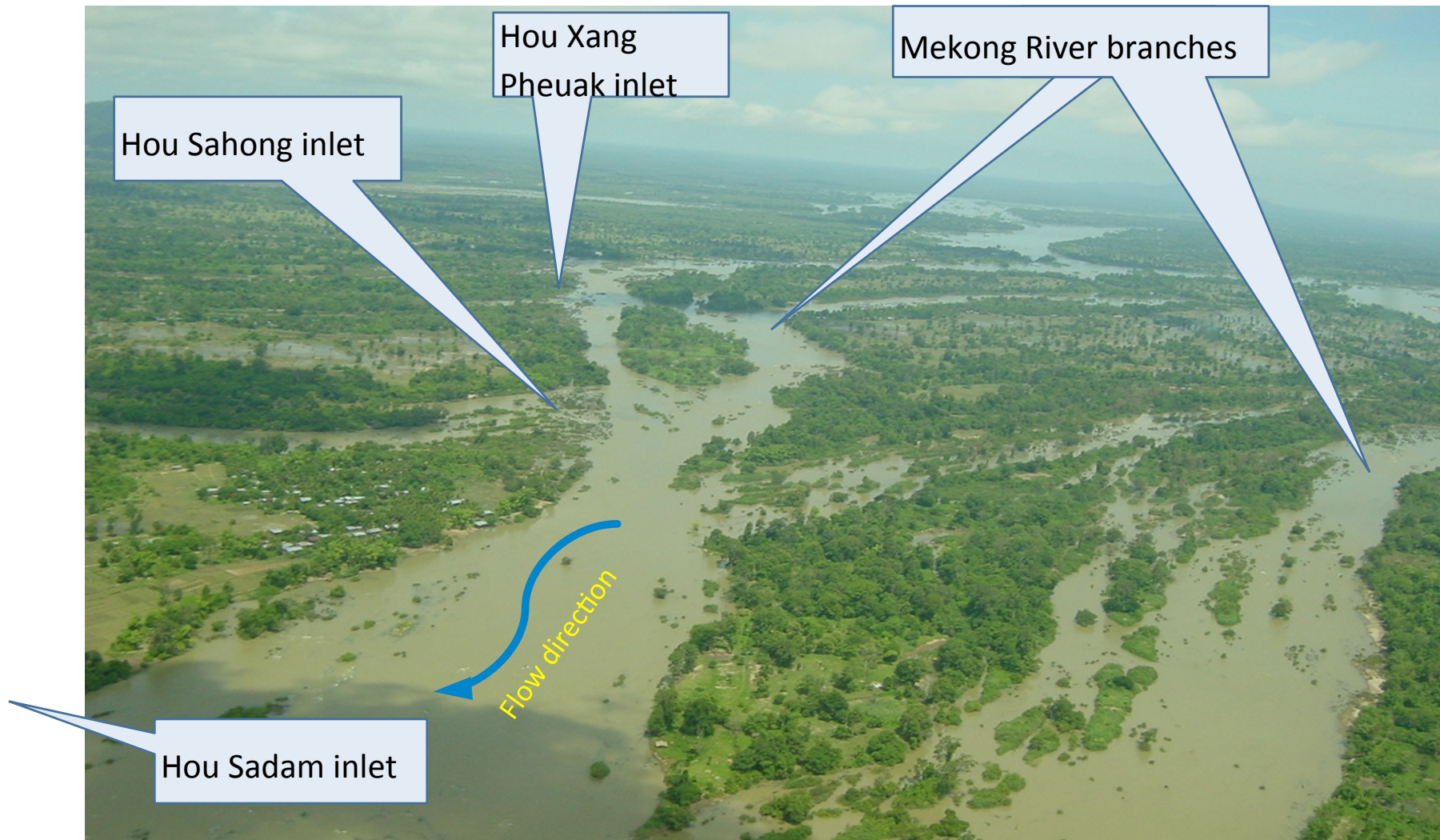
Further explanation of hydraulic modelling

- Additional hydraulic modelling has been carried out since the studies already published
- CFD (3D) *Telemac* computational hydraulic model to further evaluate flow and water level characteristics both pre and post DSH development
- Has verified the earlier modelling and refined our knowledge of water levels and flows in all branches of interest



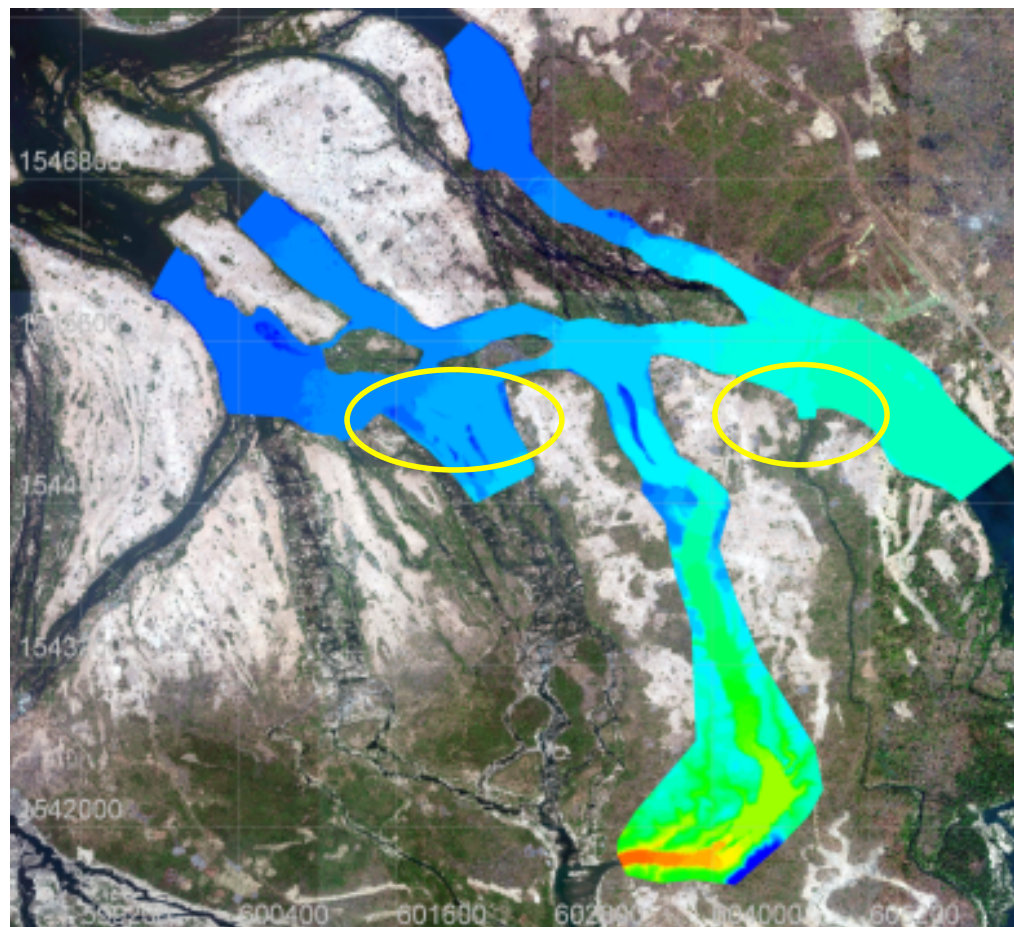
Conclusion: We now have a very good understanding of the complex river hydrology of the branches of interest.

Flow Changes in Branches

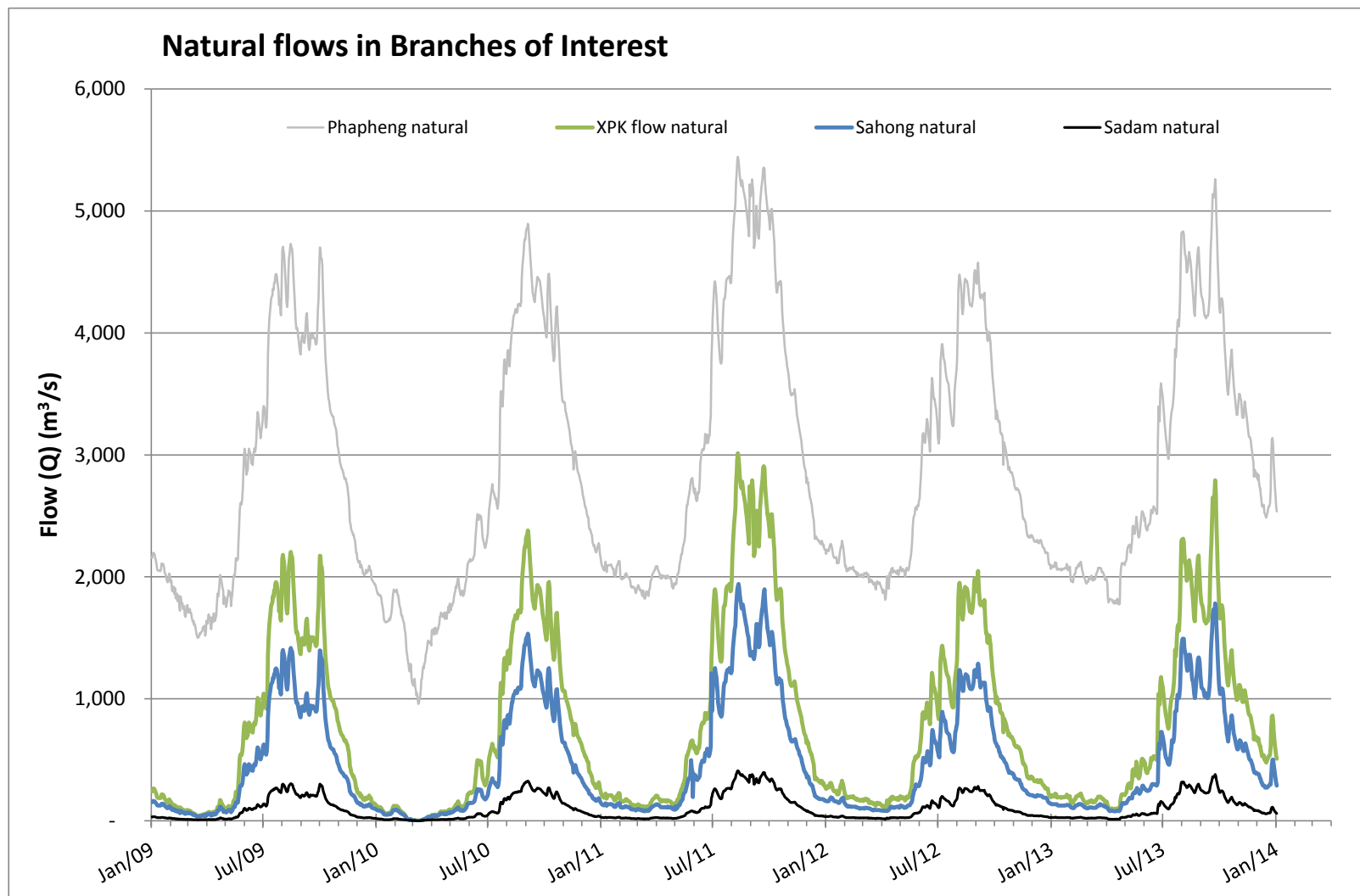


Flow Changes in Branches

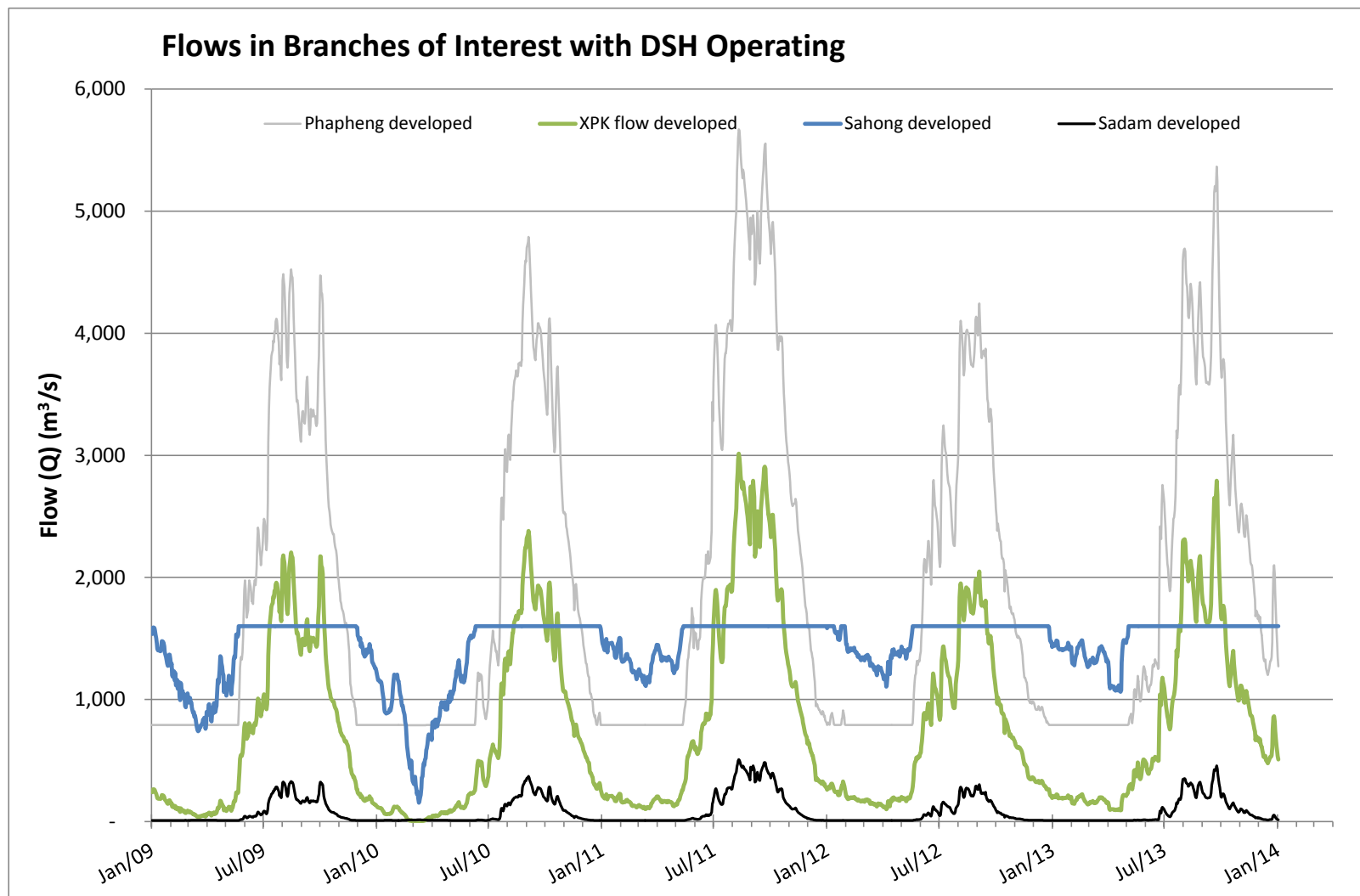
- Flows in the Hou Xang Pheuak **will not change** as DSH is downstream of the HXP inlet, and will not significantly change the water levels at HXP inlet
- Hou Saddam is downstream of DSH inlet and water levels will be lower at the Saddam inlet as a result
 - Targeted excavation to lower the Saddam inlet a corresponding amount, so as to **maintain the current flow regime** into the Saddam



Flow Changes in Branches



Flow Changes in Branches

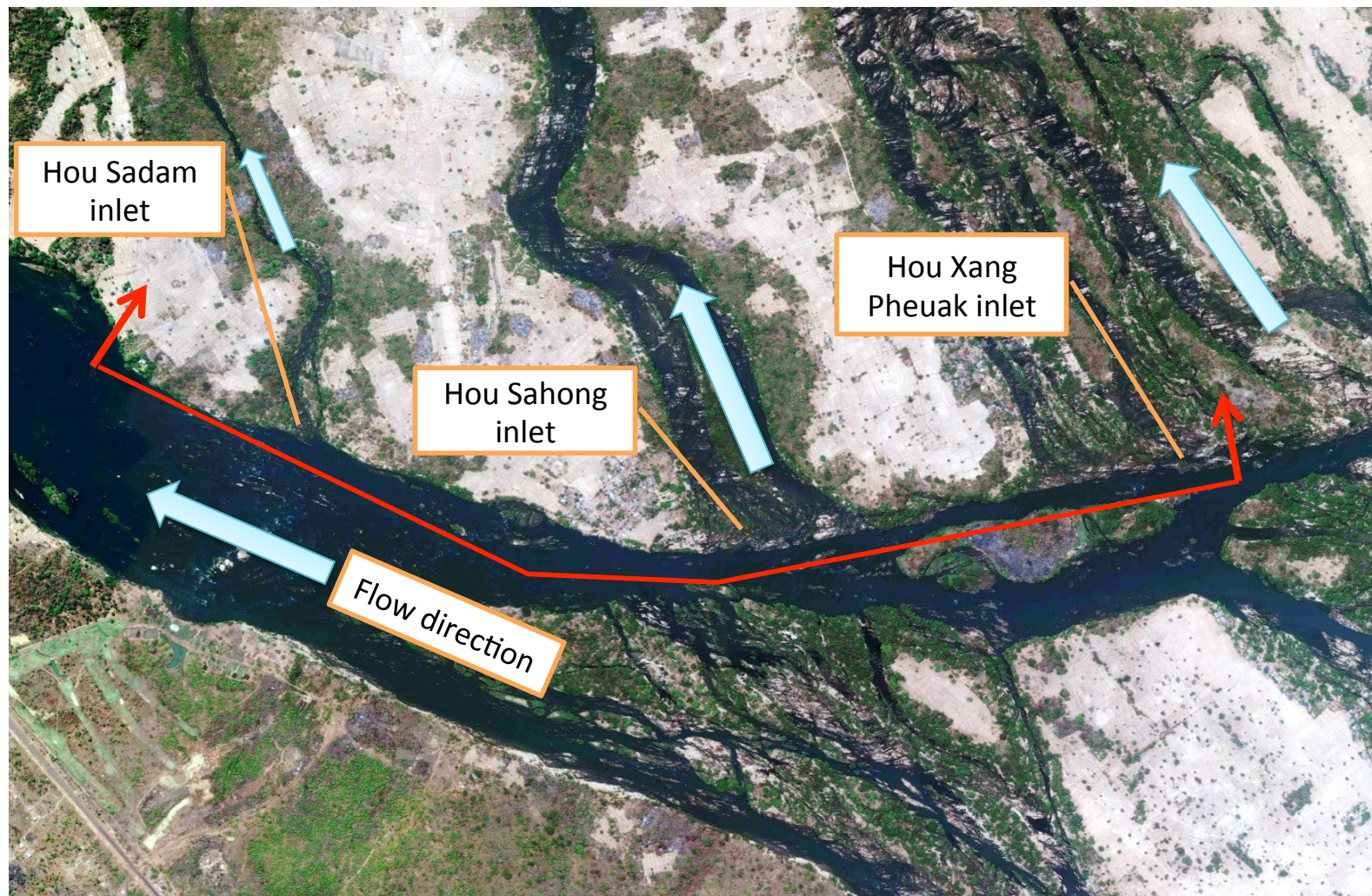


Hou Xang Pheuak Inlet

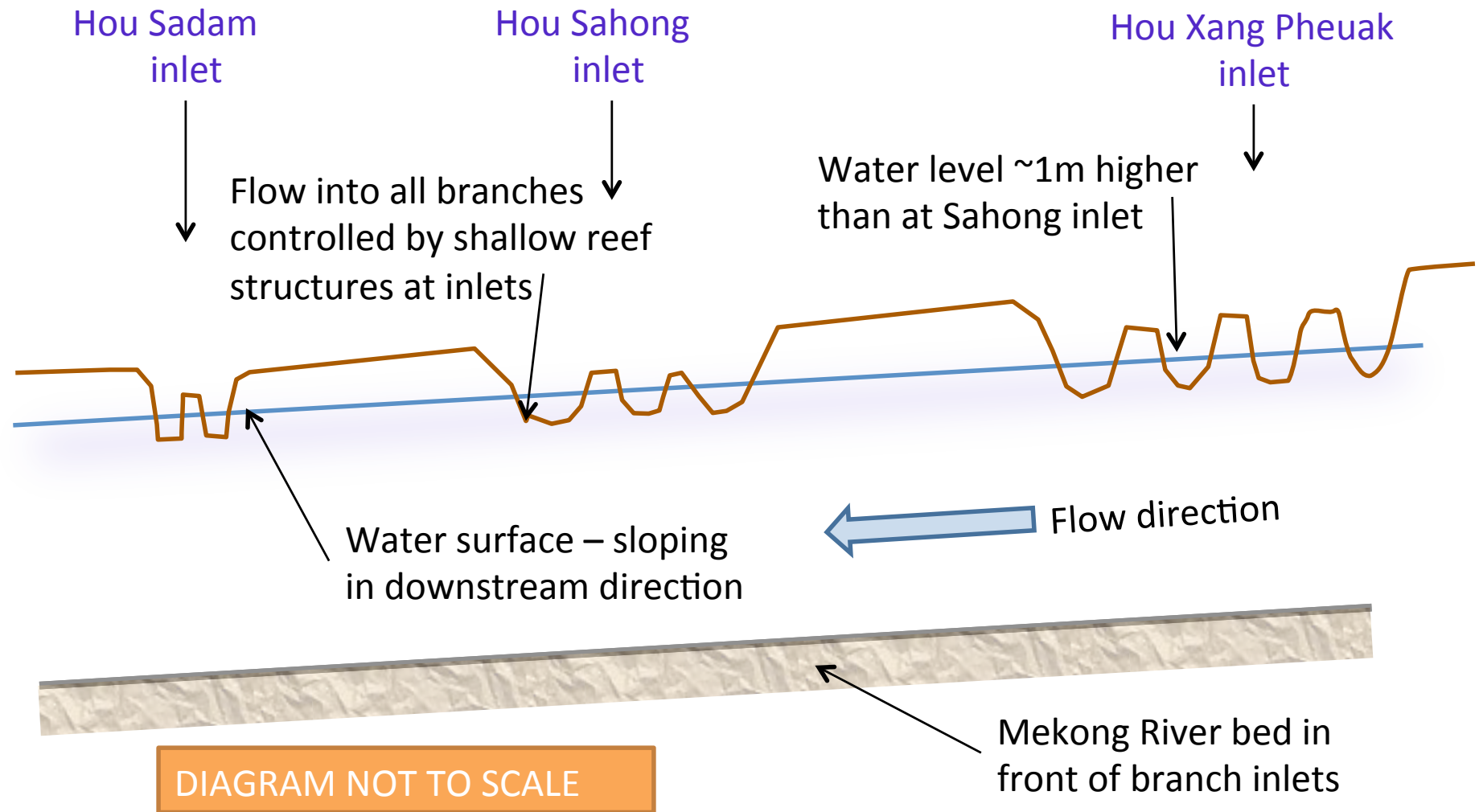
photo taken May 2006 (late dry season – total Mekong flow = 2,700 m³/s)



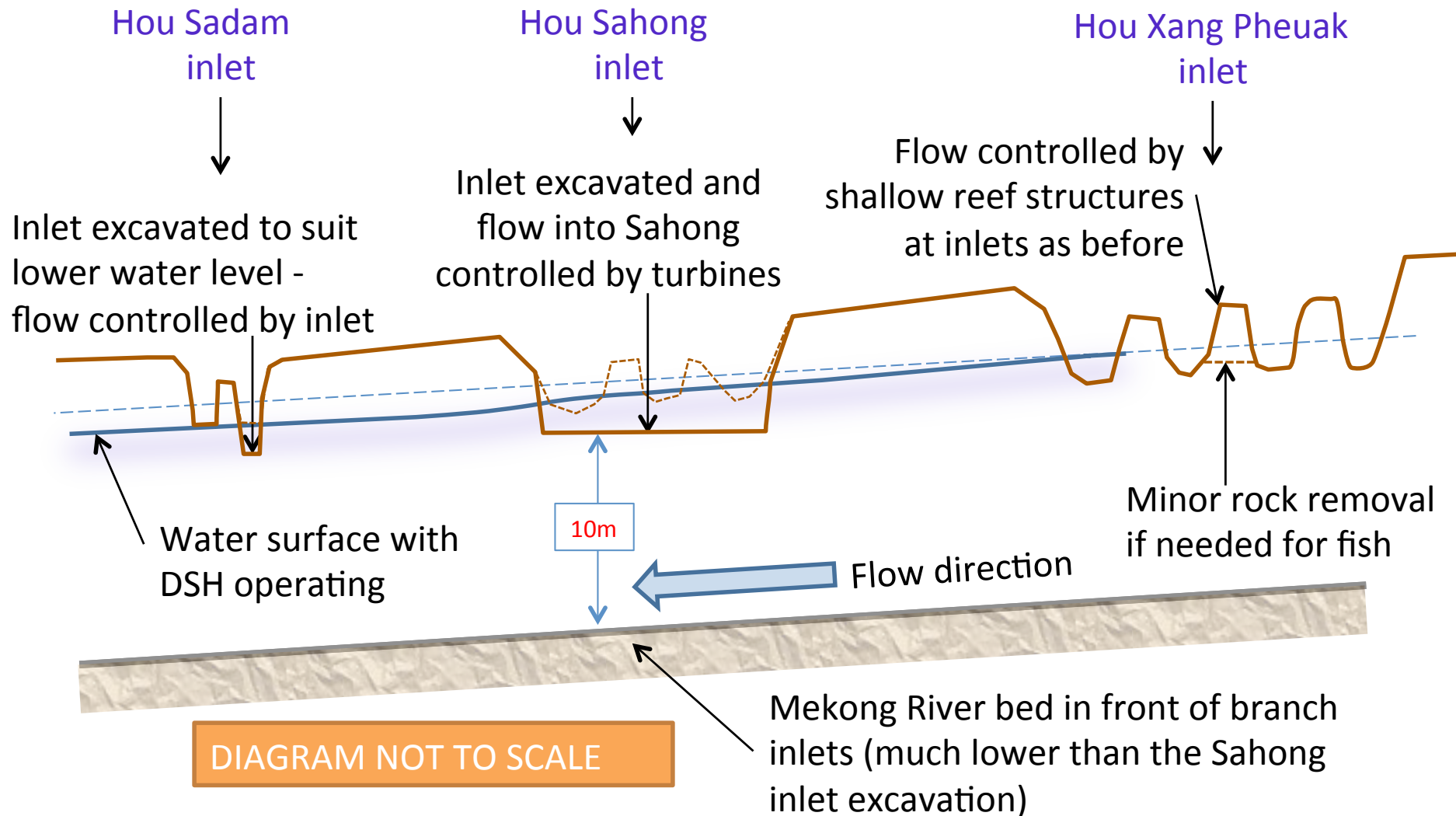
Flow Into Branches



Flow Into Branches – Existing Conditions



Flow Into Branches – With Don Sahong



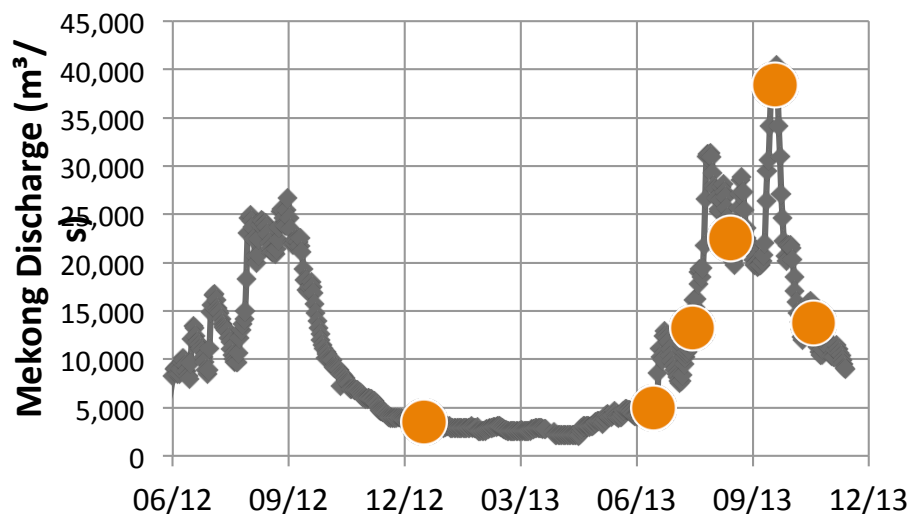
Hydrology – Summary

- DSH re-distributes some flow from the Phapheng channel to the Sahong channel
- The natural river flows and levels above and below project will remain unchanged
- Flows over the Khone Phapheng Falls will be maintained at all times as a priority by regulating the turbine flow
- Simple solutions involving targeted excavation at Hou Xang Pheuak and Hou Sadam inlets can and will be engineered that will achieve appropriate flow regimes for fish in both branches
- MRCS preliminary review found no major issues, MFCB considers that the further investigations recommended by MRCS have now been covered by the further work already undertaken.

Sediment – Overview

- Main issues covered:
 - Sediment sampling – suspended and bedload
 - Sediment modelling
 - Sediment management during operation
 - Impact of DSH on overall Mekong sediment budget

Sediment – Site Sampling



Include information on sediment sampling

- MRCS review recommended sediment sampling
- 6 Sampling visits were carried out in 2012-2013, across all river conditions
- Suspended sediment and bedload sampling at 6 cross-sections
- Summary factual report will be available



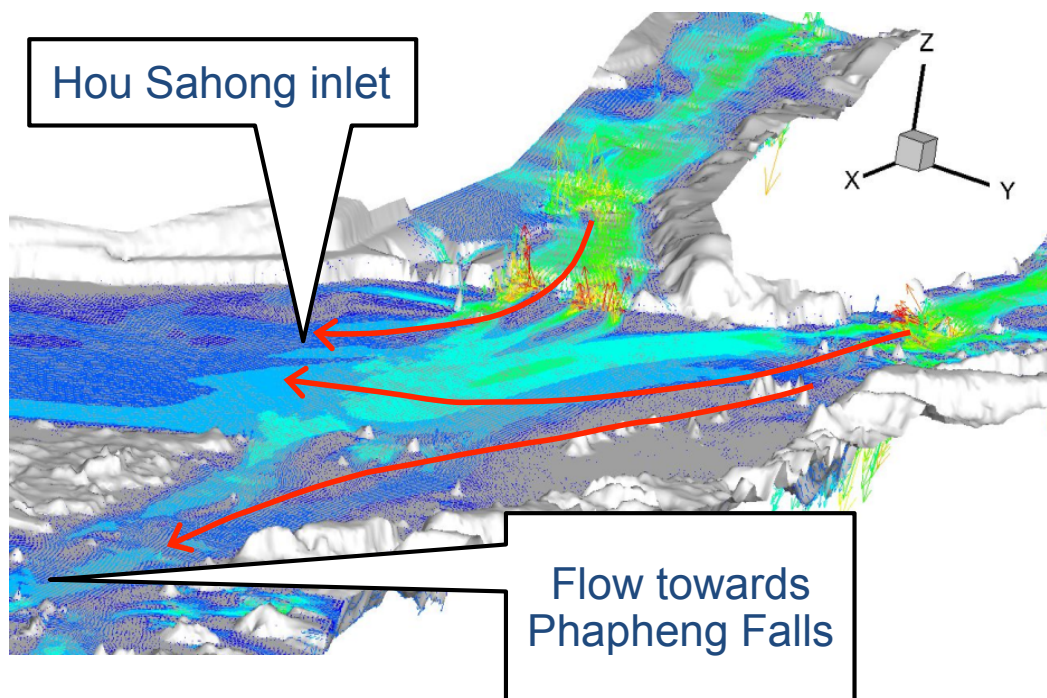
Sediment - Management

Provide an improved understanding of sediment transport regime

- Sediment routing and sediment bypass are provided by other natural channels which convey 90% of the sediment load, thus only 10% of the total Mekong sediment load will enter the headpond.
- A majority of the 10% of the Mekong sediment load which enters the headpond will be naturally flushed through the turbines.
- The four turbines are located at the lowest point of the headpond, naturally allowing sediment to pass through with generation flows, effectively acting as low level gates.
- **Computational modelling** was used to evaluate when, where and how much of the remaining sediment portion is deposited in the headpond.

Sediment Modeling

Sediment transport and deposition was modelled by dynamic simulation over a 3 year period starting from the first year of operation



Model Findings

- Sediment deposition occurs on the wet season rise, then re-suspension occurs as the wet season recedes
- Annual equilibrium condition is reached after 2-4 years of operation (depending on actual flood hydrology that occurs)

Sediment – Summary

- The modelling has demonstrated that sediment pass-through is sufficient to develop ***equilibrium conditions*** simply by normal operation of the turbines at their normal design flow (1600 m³/s) and **without draw-down flushing**. This is a positive change from what was reported previously.
- This means the sediment concentrations from the power station discharge will mimic the natural river concentrations
- Once equilibrium is reached, there will be ***no change in the annual sediment budget*** during the operational life of the project. The MRCS review concurs with this finding

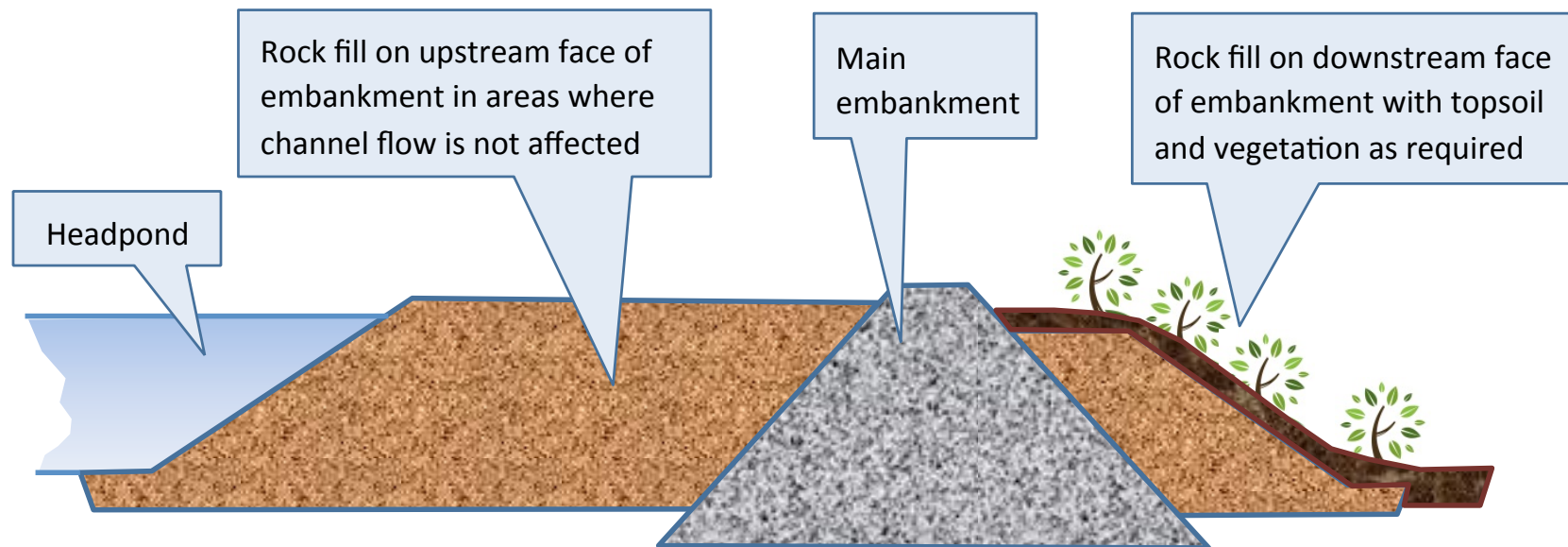
Construction Effects

- Main topics covered:
 - Sediment release from excavations
 - Disposal of surplus excavated materials
 - Avoidance of impacts on dolphins/fish

Disposal of Excavated Material

Will the excavations cause release of sediment to the river environment?

- The amount of sediment generated during the excavations will be extremely small compared to the natural sediment load of 1-2 million m³/day in wet season
- All material excavated during construction will be utilized in permanent works
- Surplus rockfill will be placed against the embankment and will be protected from erosion, so there will be no additional sediment caused by DSH operation



Location of Outlet works



Power station location

Hou Sahong outlet

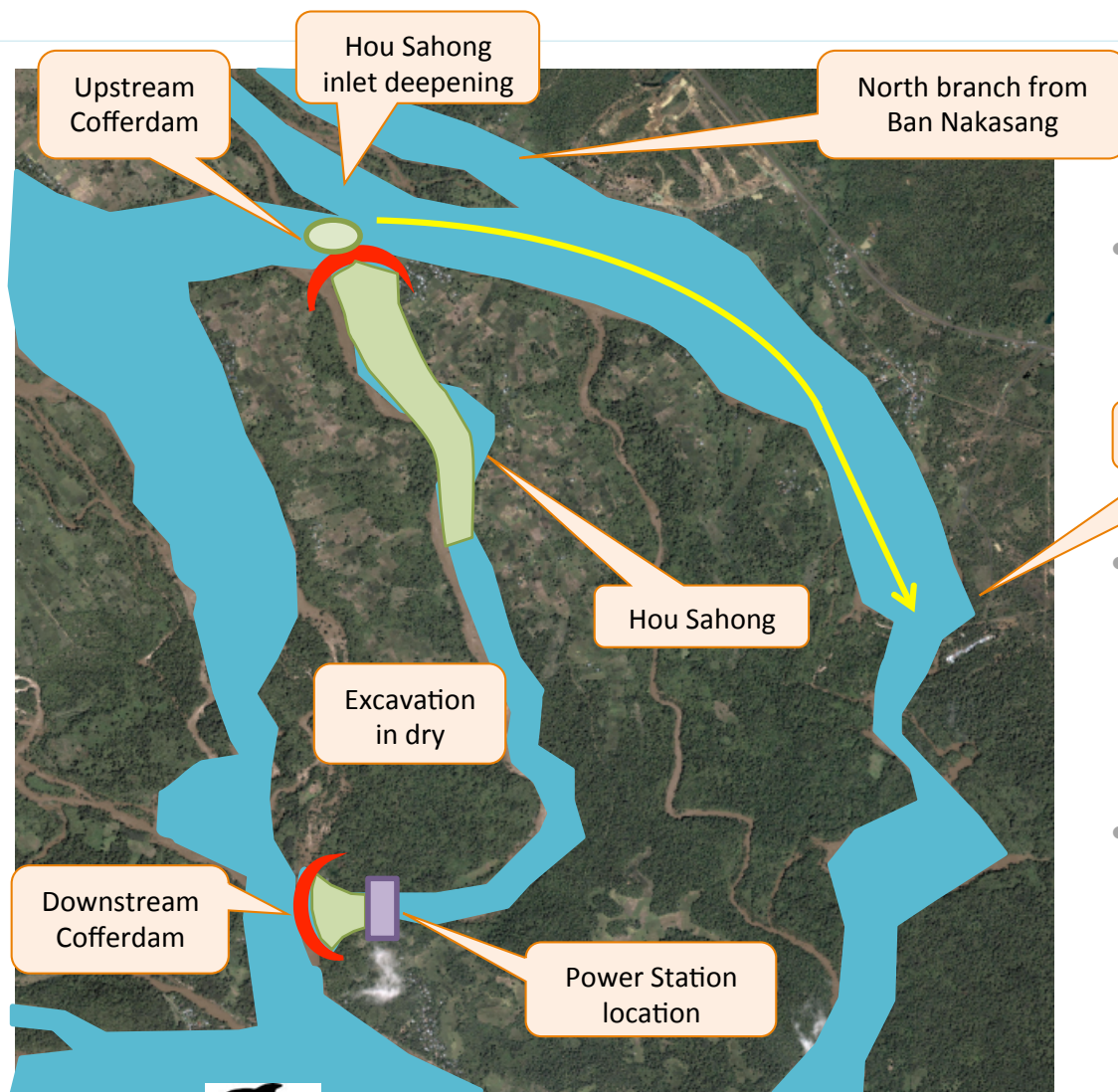
Hou Xang Pheuak outlet



Power station location

Hou Sahong outlet

Allaying concern over Excavation and Water Quality impacts during construction



Clarification on channel excavation and blasting

- Temporary cofferdams are constructed at upstream and downstream ends
- All excavation at the downstream end will be carried out in the dry behind the cofferdam
- There will be no underwater blasting downstream

Construction Effects – Summary

- Sediment generated by construction activities will be very minor compared with baseline sediment concentrations
- All excavated materials are disposed of as part of the permanent works
- All excavation at the downstream end will be carried out in the dry behind a cofferdam
- There will be no underwater blasting downstream



Environmental Studies and Fish Migration Pathways

Dr Peter Hawkins