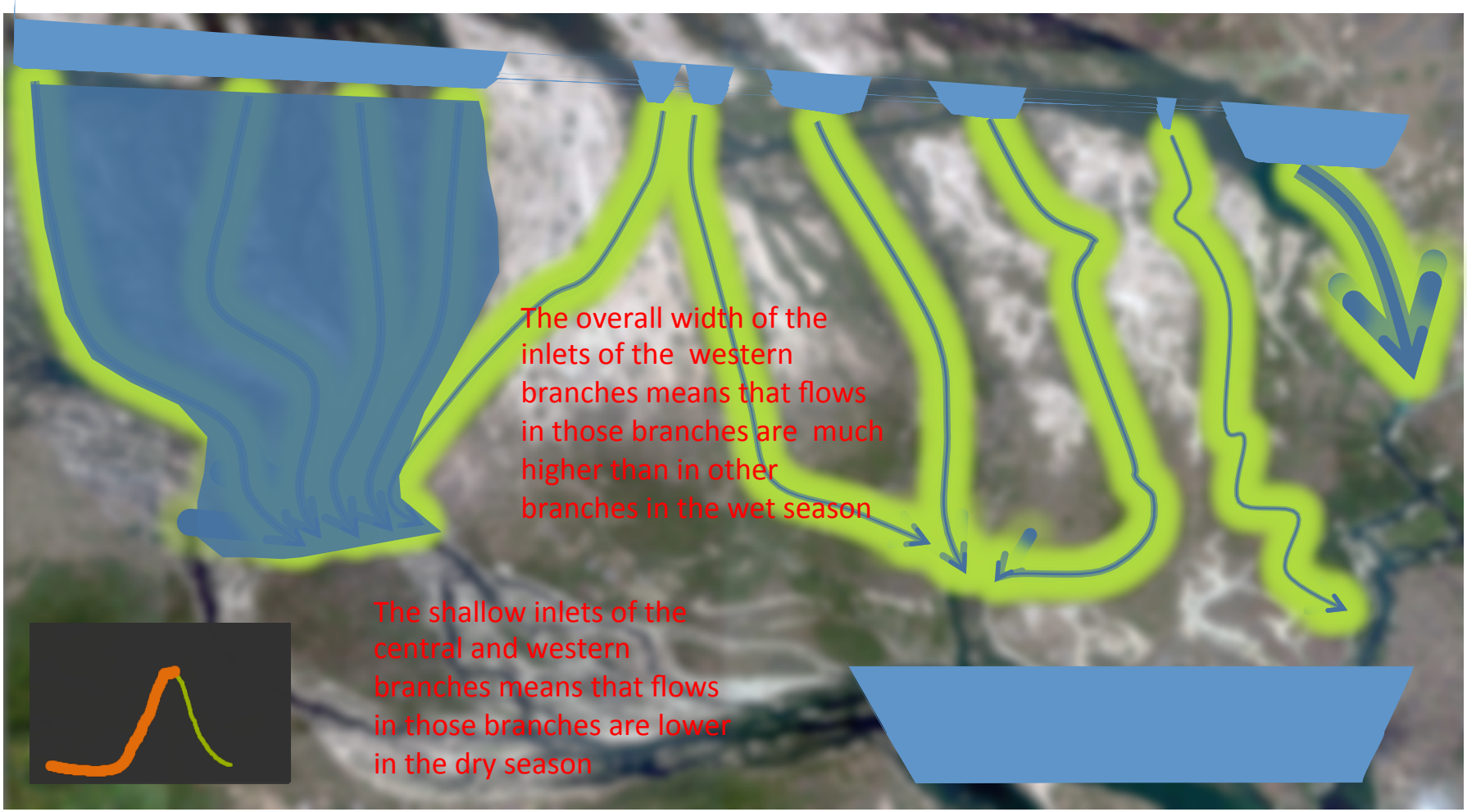
Hydrology – Overview

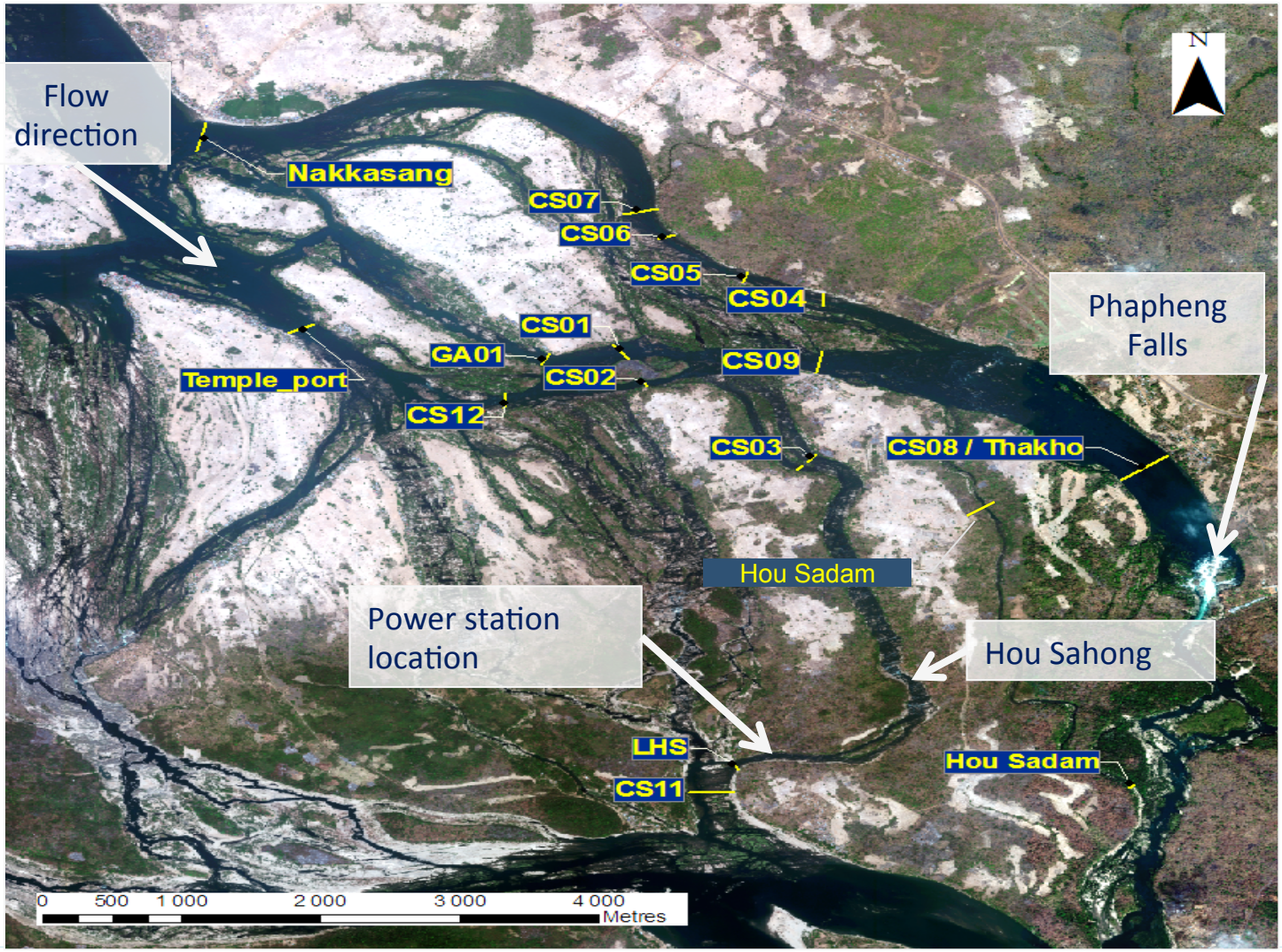
- Brief overview of hydrology
  - Seasonal flow variations across the 'Great Fault'
  - Additional data collection and hydraulic modelling
  - Flow changes - Hou Sadam and Hou Xang Pheuak

- Main discussion on hydrology is on how it relates to fishery aspects – to be further discussed by fishery specialists

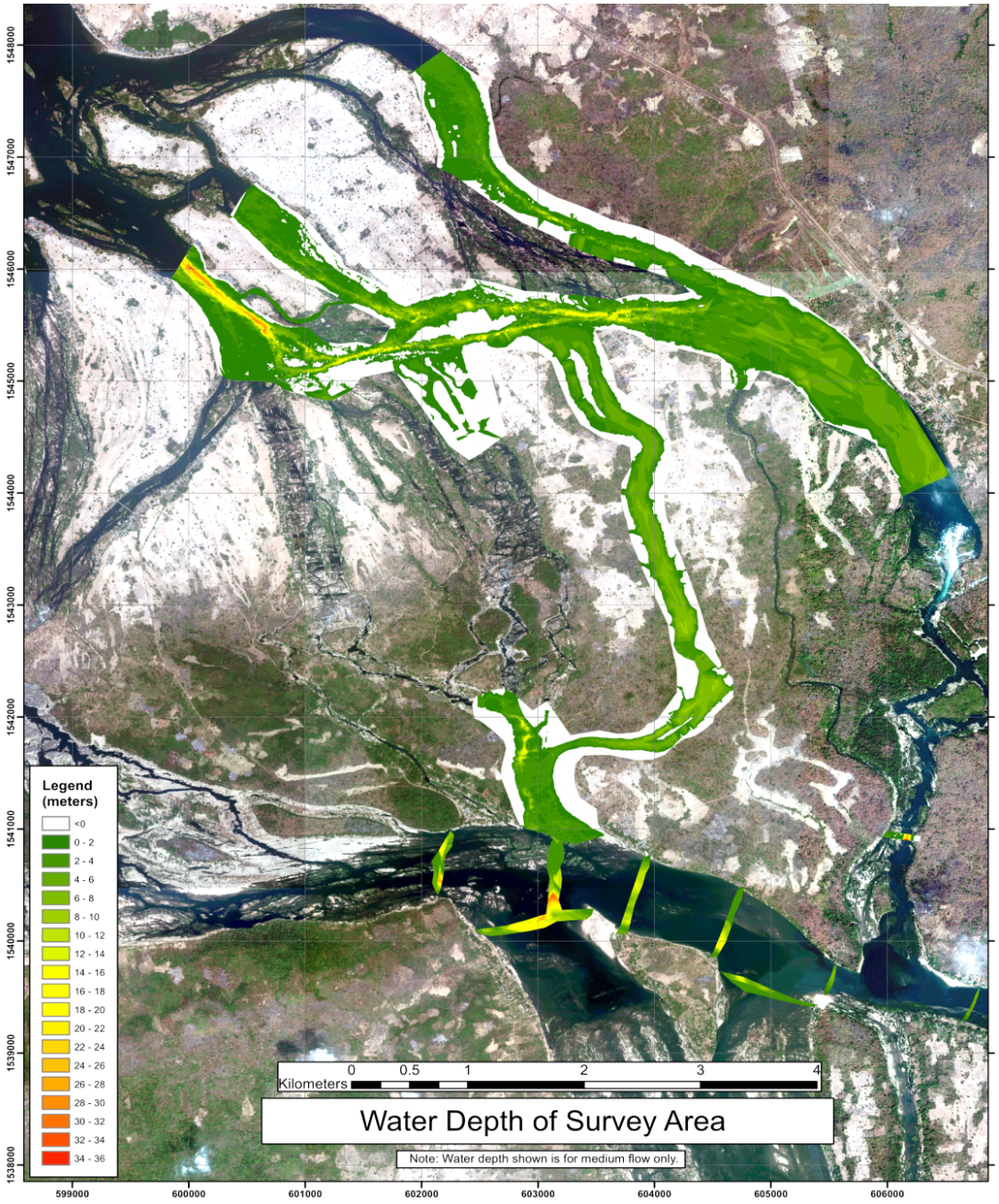
Hydrology - Seasonal Flow Distribution for the various main channels



Data Collection – Flow Gaugings



Data Collection – Bathymetry

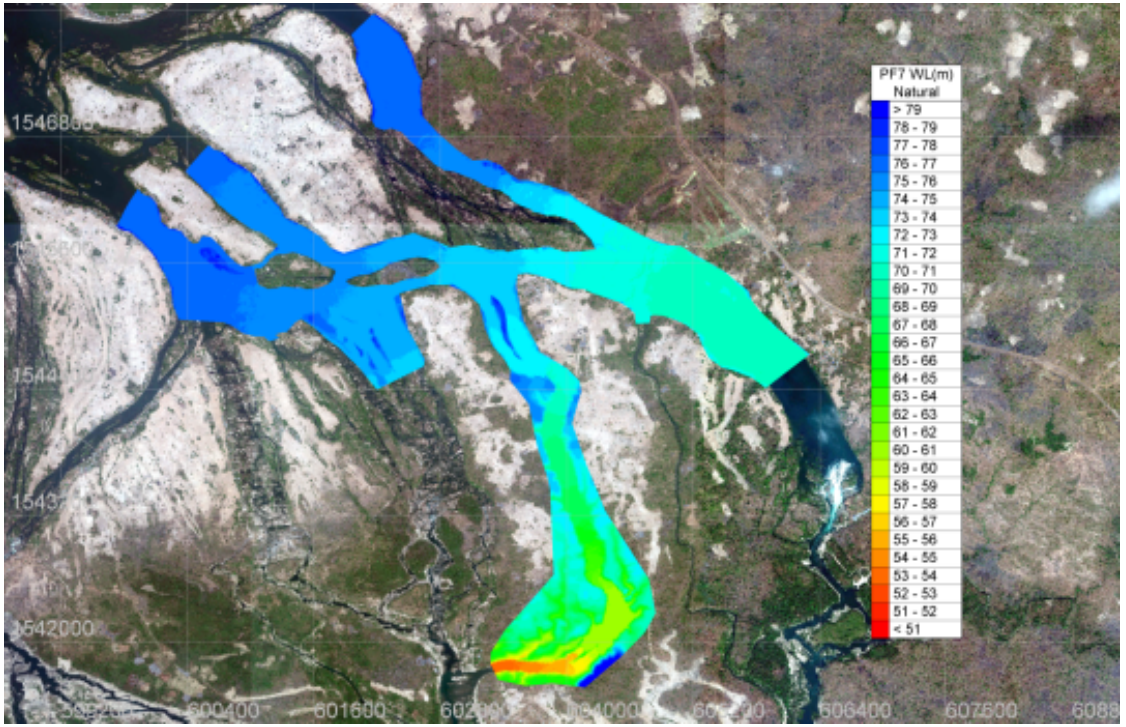


- The additional data has been used to refine the bathymetric model and extend study of upstream and downstream water levels
- Used to assist fish passage studies
- Improved understanding of deep pools

Hydrology – Modelling & Water Level Changes

Further explanation of hydraulic modelling

- Additional hydraulic modelling has since been carried out and report prepared
- 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

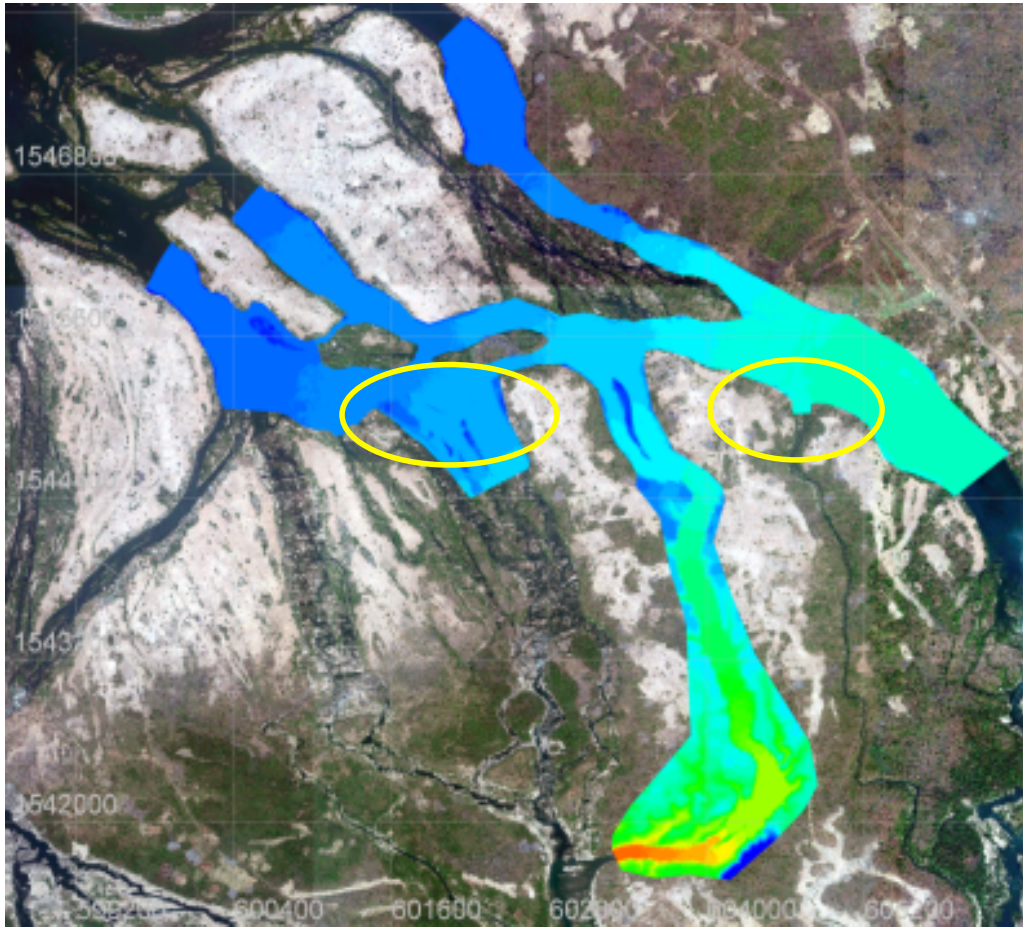


Conclusion: We now have a very good understanding of the complex river hydrology of the branches of interest.

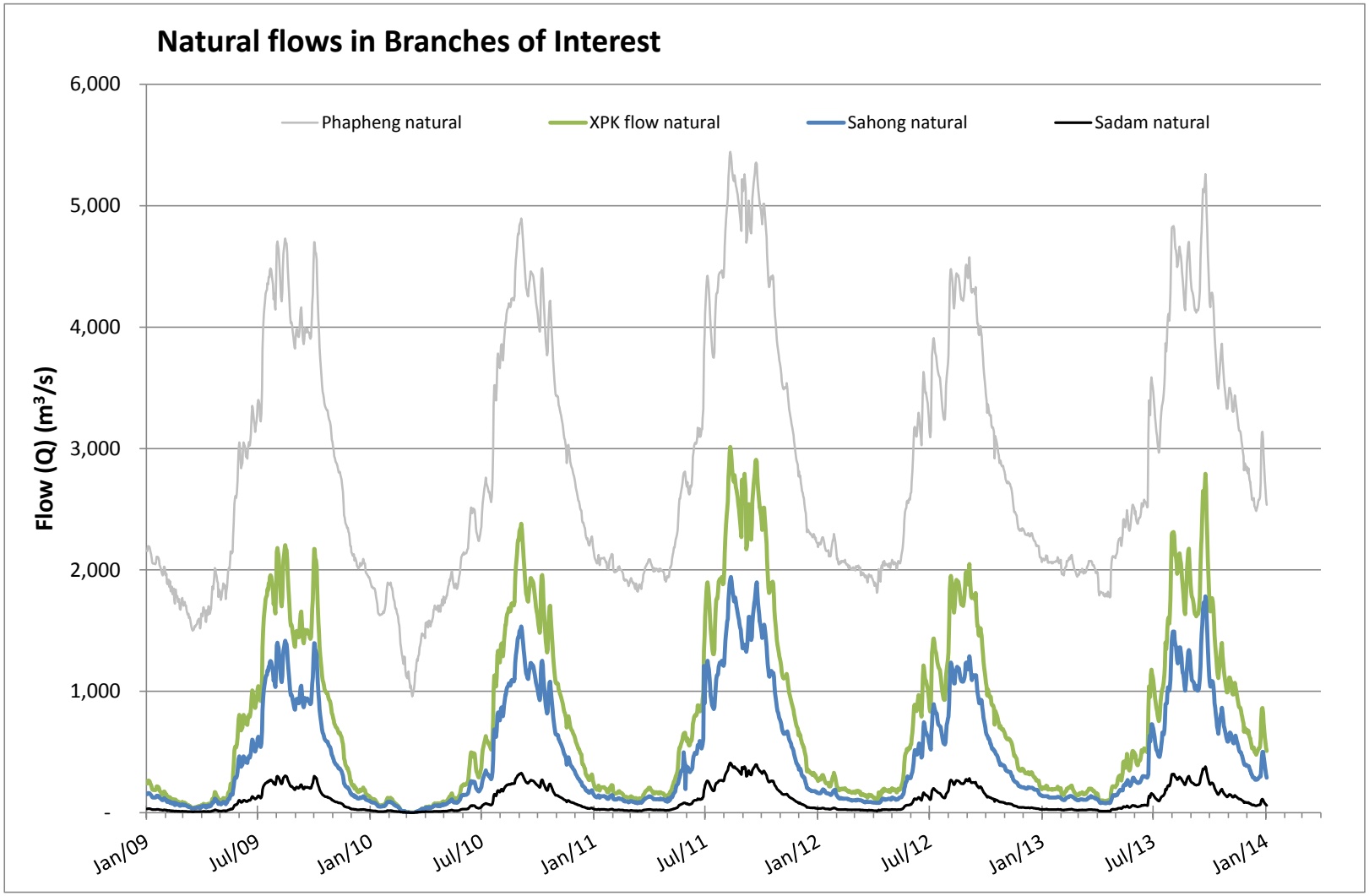
Hydrology – Flow and Water Level Changes

- Flows in the Hou Xang Pheuak **<u>will not change</u>** as DSH is downstream of the HXP inlet, and will not significantly change the water levels at HXP inlet

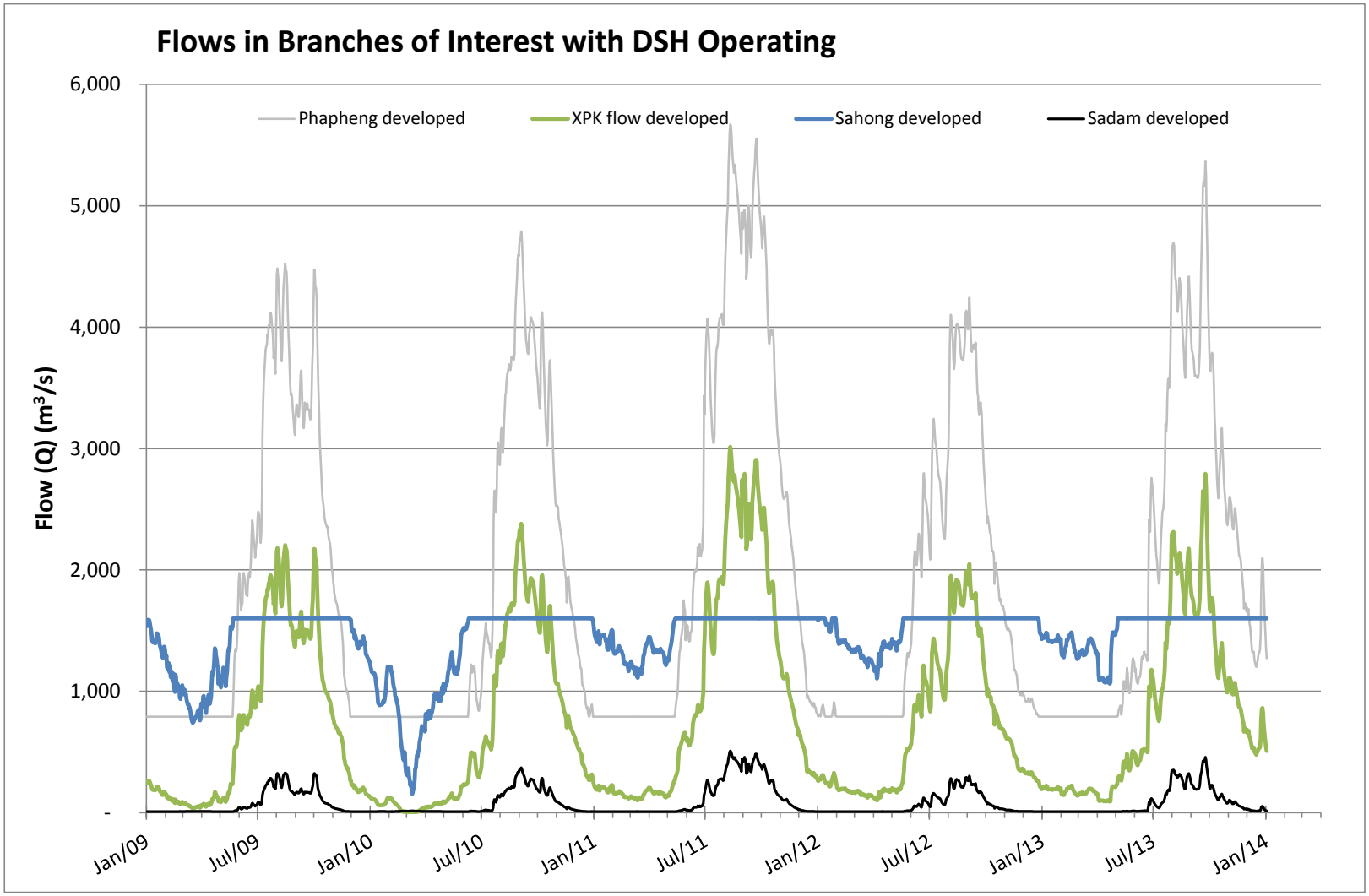
- Hou Sadam is downstream of DSH inlet and water levels will be lower at the Sadam inlet as a result
  - Targeted excavation to lower the Sadam inlet a corresponding amount, so as to **<u>maintain the current flow regime</u>** into the Sadam



Flow Changes in Branches



Flow Changes in Branches



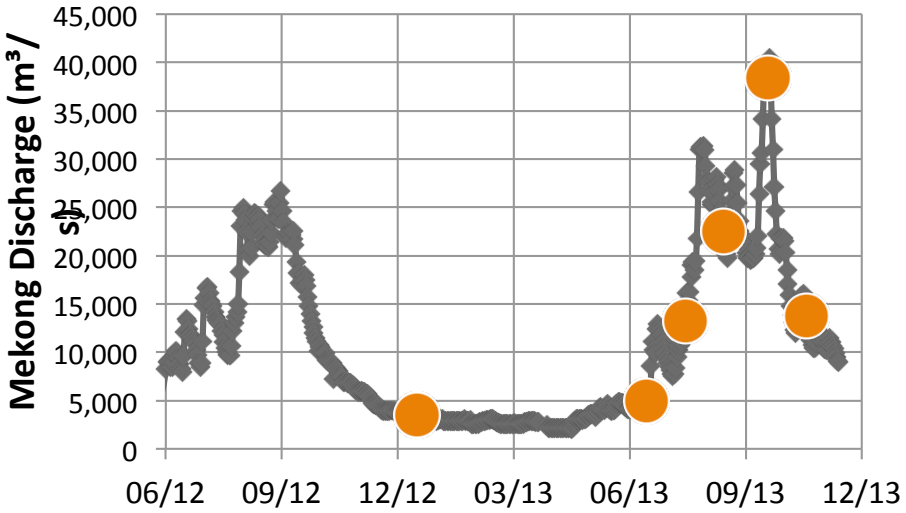
Hydrology – Summary

- Additional data and more sophisticated modelling now provides a strong basis for verifying the previous work and an improved understanding of the hydrology before and with DSH
- Provides a high degree of confidence that effective fish passage can be designed
- Simple solutions involving targeted excavation at Hou Xang Pheuak and Hou Sadam inlets can and will be engineered that will achieve appropriate flow regimes in both branches

Sediment Transport – Overview

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

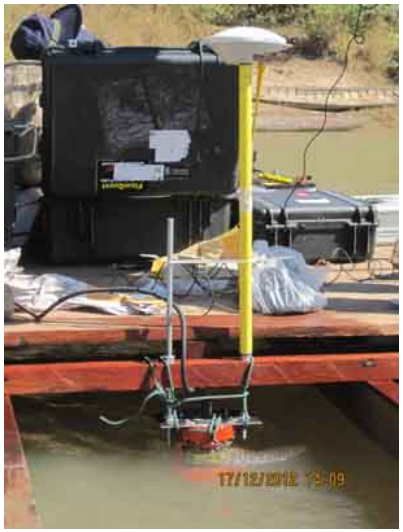
Sediment – Site Sampling



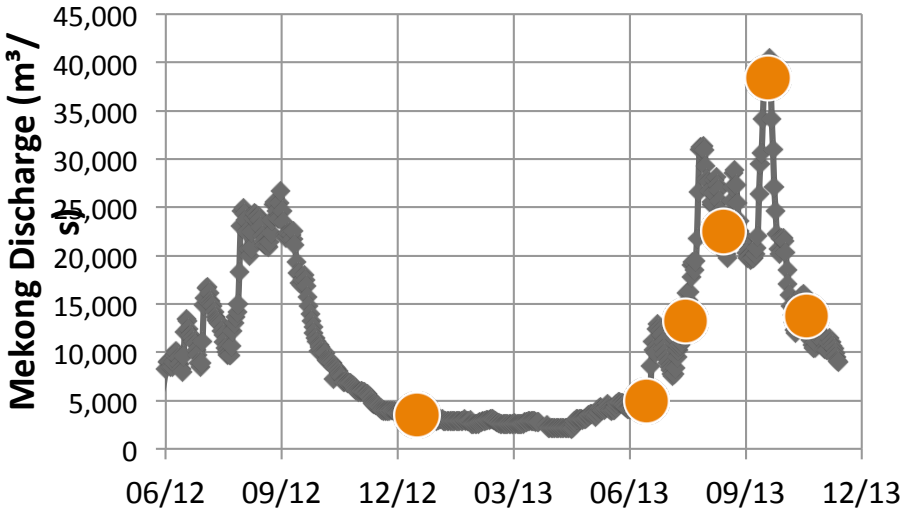
Include information on sediment sampling

- 6 Sampling visits 2012-2013, across all river conditions
- Summary factual report available, including results from Visits 1-3.
- Samples from Visits 4-6 are under analysis and will be added to the report once available
- Suspended sediment and bedload sampling at 6 cross-sections

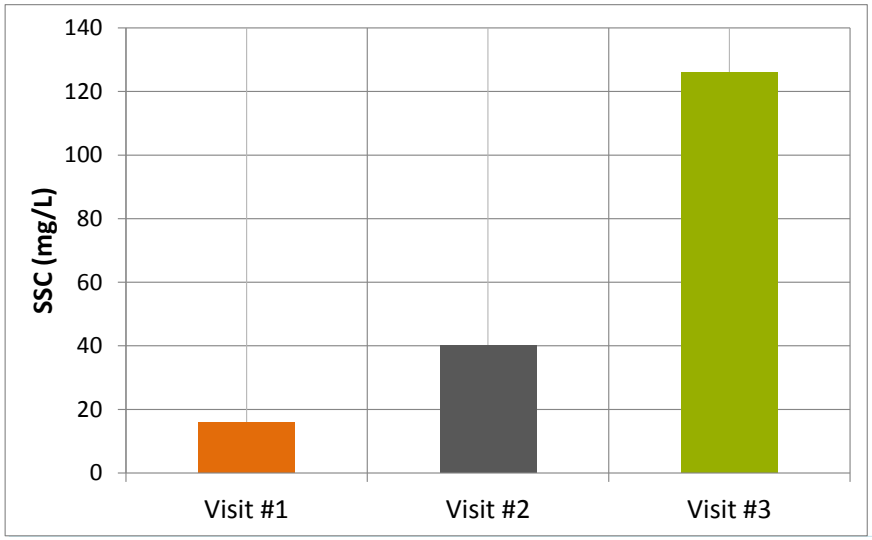
Sediment - Sampling Campaign

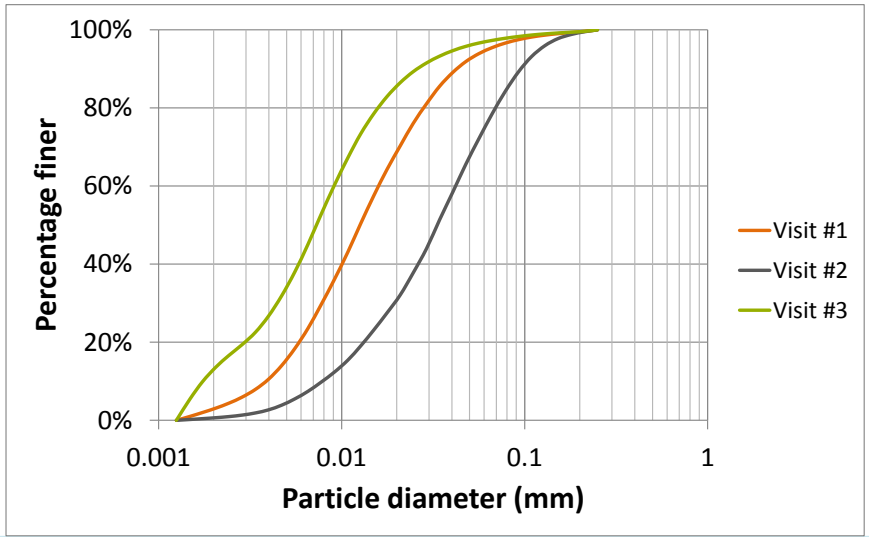


Sediment – Site Sampling



- Results from Visits 1-3:
  - Increasing suspended sediment concentration as wet season arrives, in line with expectations
  - Suspended sediment median particle size significantly finer during early wet season (Visit 3)





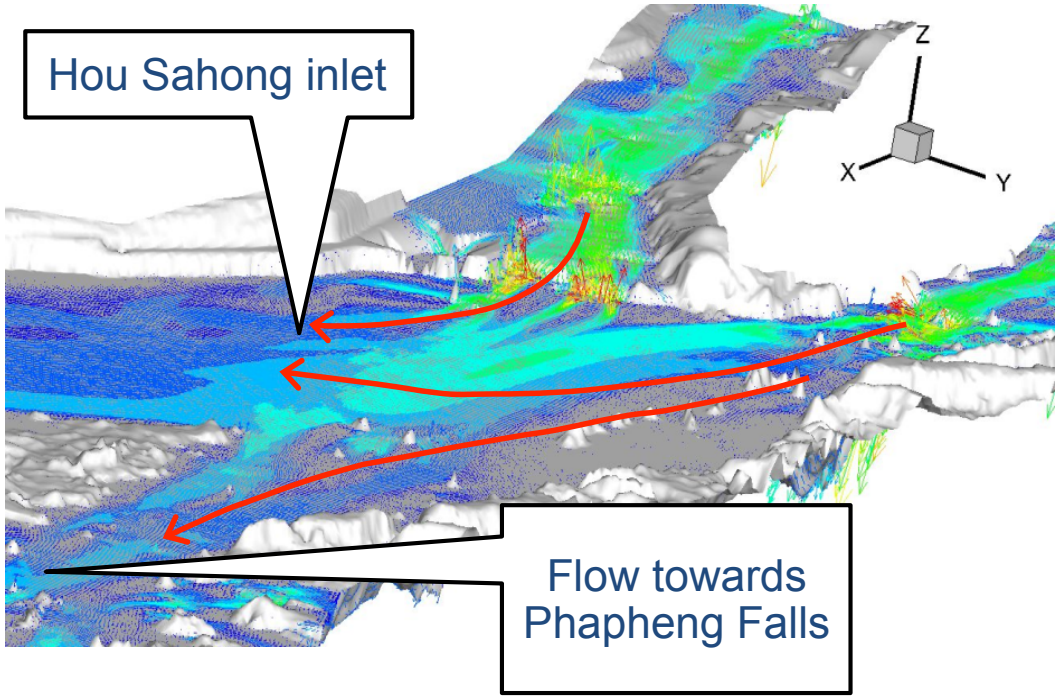
Sediment - Management

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 – results to be published

Sediment Modeling

- Sedimentation has now been investigated with *Telemac* computational hydraulic model (based on the new CFD hydraulic model)
- Modeled sediment transport over a 3 year period starting from the first year of operation



Model Findings

- Deposition occurs in slow-flowing areas of headpond during wet season
- Channel is then eroded and sediment re-suspended as wet season recedes and headpond level reduces
- Annual equilibrium condition is reached after 2-4 years of operation (depending on actual flood hydrology that occurs)

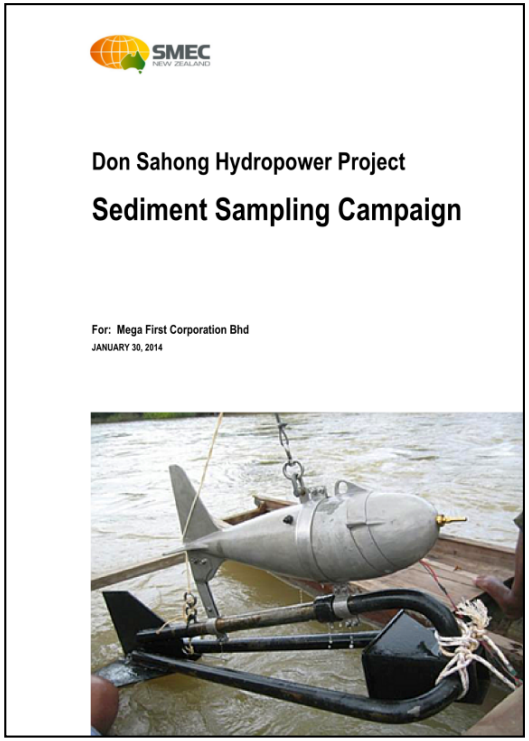
Sediment – Management

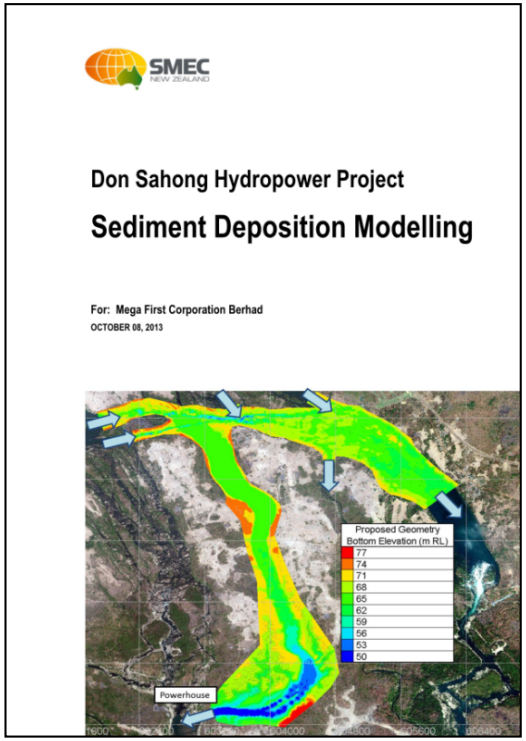
Results of computational modelling….

- The computational 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 m^3/s) and without draw-down flushing. Therefore low level gates are not required for this purpose.
- Once equilibrium is reached, there will be ***no change in the annual sediment budget*** during the operational life of the project.

Sediment Transport – Data and Reporting

Additional reports of the sediment sampling campaign and sediment modelling have now been prepared in draft form and will be made available.





Sediment Transport – Summary

- The studies have shown that the Project will not modify the overall Mekong sediment budget, which is concurred by the MRCS review
  - *MRCS Review – Annexe 4, #6: Due to the physical characteristics of the head pond, long-term impacts on the regional sediment balance are not possible.*
- Operation of DSH will not modify the natural sediment regime of the Mekong River due to its run of river operation and short headpond retention time – a truly transparent dam