

The 6th Regional Stakeholder Forum

Second Regional Information Sharing on Pak Lay Prior Consultation Process

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Luang Prabang, Lao PDR



Second Draft Technical Review on Navigation

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Contents of Presentation

- I. Background
- II. Main review findings
- III. Recommendations

I. Background (1)

**The review of the Navigation subject with attention to public concerns
(Main Review findings):**

- Lock design, structure and equipment,
- Navigational aspects of approaches
- Filling and Emptying system
- Operation, safety and maintenance.

I. Background (2)

Information retrieved from following submitted documents:

- Feasibility Study report – Final – Chapter 5-7:
 - 5.9 Navigation Structure
- Pak Lay Feasibility Study Review – Final Report
Ministry of Energy and Mines – Lao PDR, January 2017 –
 - Chapter 8: Navigation Aspect, Shiplock – Navigation Lock System
- Drawings.
 - Layout of ship structure (1-2)
 - Layout of ship structure (mostly consisting of cross sections)

I. Background (3)

Guidance/Tool Documents:

- MRC's **Preliminary Design Guidance** for Mekong Mainstream Dams in the Lower Mekong Basin (PDG) 2009;
- The MRC study “**Review of International Ship Lock Dimensions** and their Relevance to the Proposed Hydropower Developments on Mekong Mainstream dams”;
- **PIANC (World Association for Waterborne Transport Infrastructure)** report: “Final Report of the International Commission for the study of Locks.”
- **PIANC report nr. 106-2008: “Innovations in navigation lock design”**
- Various worldwide good practices such as studies conducted by USACE, Various internet websites dealing with ship locks, river navigation, gates and valves for ship locks etc.;

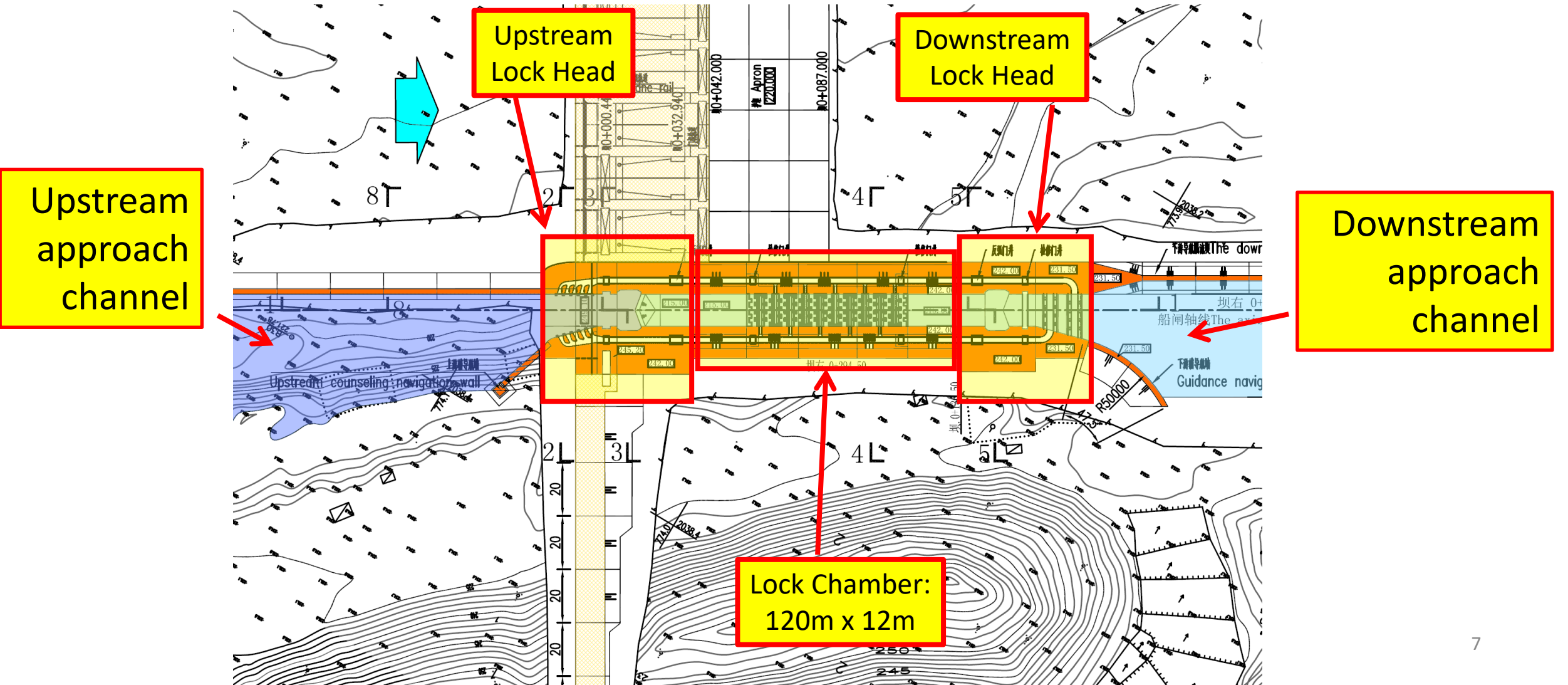
I. Background (4)

General Information :

- The navigation structure:
 - a one-way one-step ship lock
 - maximum working head (lift) is 21 m
 - the size of the lock chamber: 120 m long × 12 m wide × 4 m deep
 - a space for a second ship lock is in principle reserved.
- The lockage time of a ship is guaranteed not to exceed 30 minutes (28.38 min).
- The access channels can generally accommodate two pushed standard vessels of 500 tons, which also corresponds to a 2,000t. barge.

II. Main Review Findings (1)

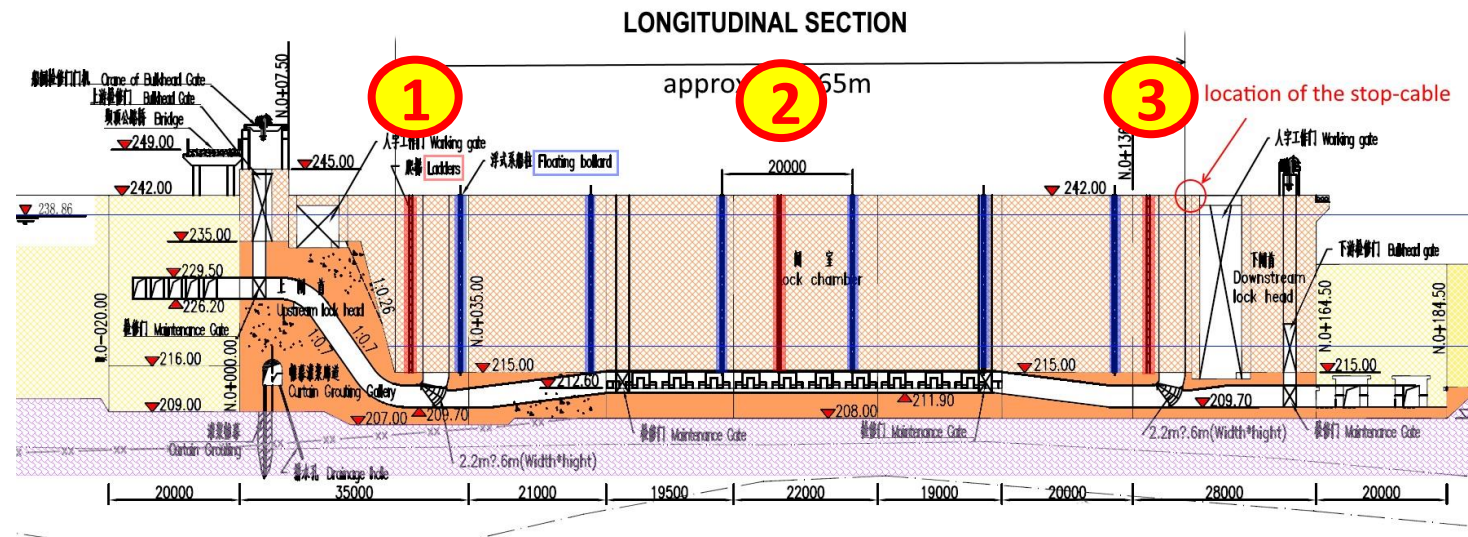
Lock design, structure and equipment:



II. Main Review Findings (2)

Lock design, structure and equipment:

- Three ladders per lock chamber wall are not enough;
- “Six floating bollards are distributed along the lock chamber...”, hence totalling 12 over the entire lock chamber. In order to be consistent with Xayaburi: 2 x 5 floating bollards per lock chamber wall would be enough;



II. Main Review Findings (3)

Lock design, structure and equipment:

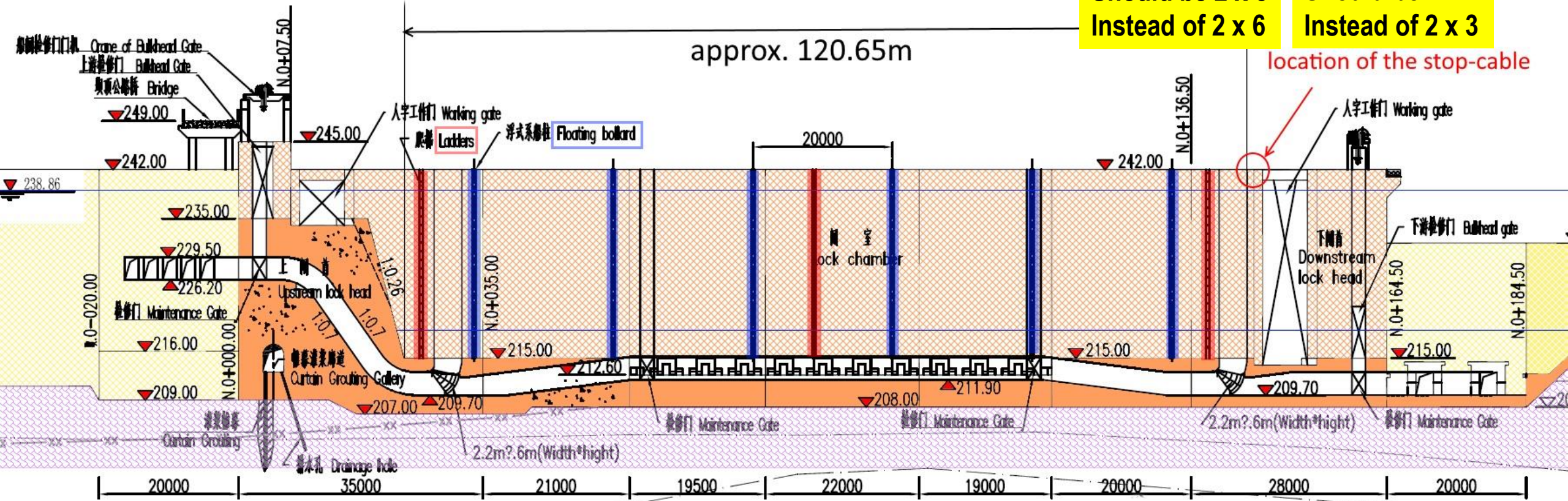
Floating Bollards **Ladders**

Should be 2 x 5
Instead of 2 x 6

Should be 2 x 4
Instead of 2 x 3

LONGITUDINAL SECTION

approx. 120.65m



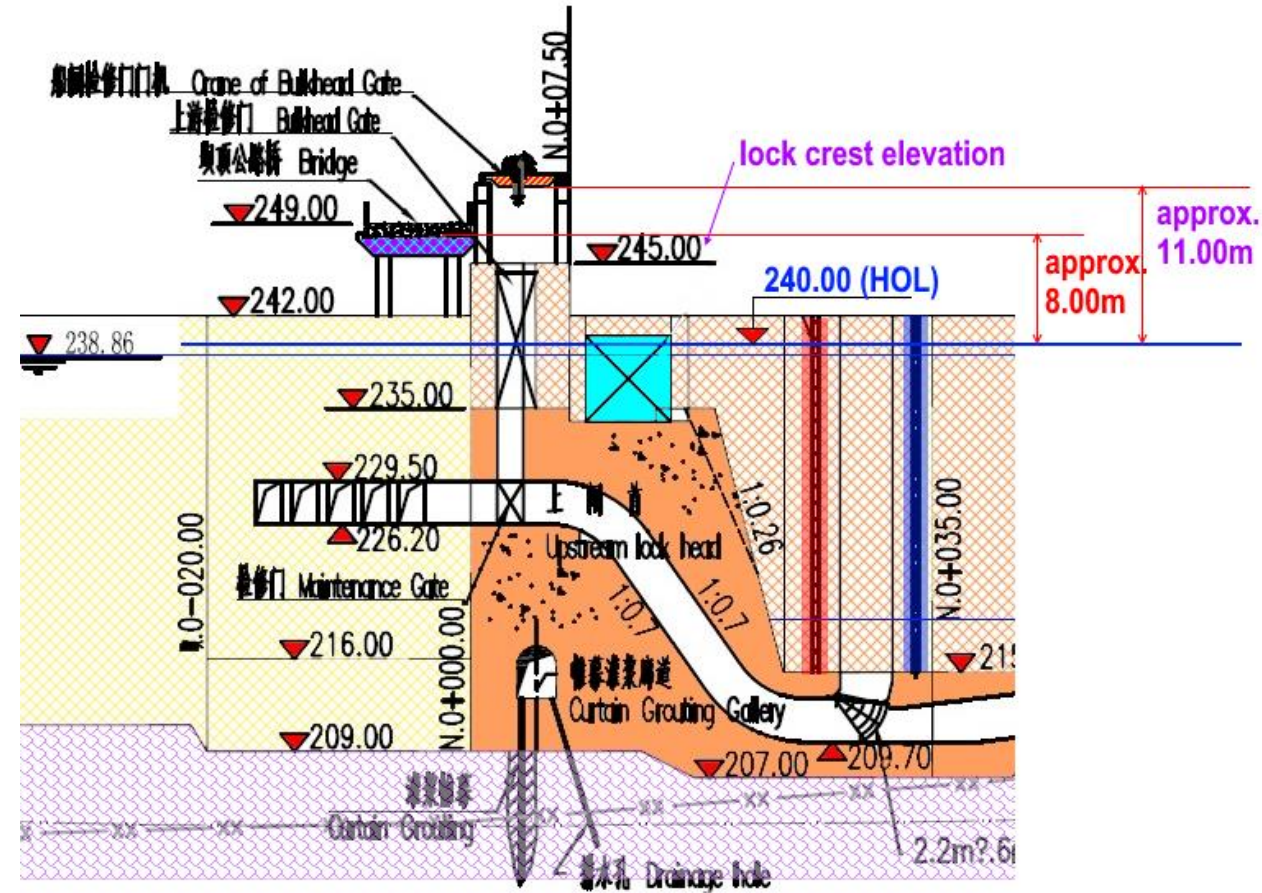
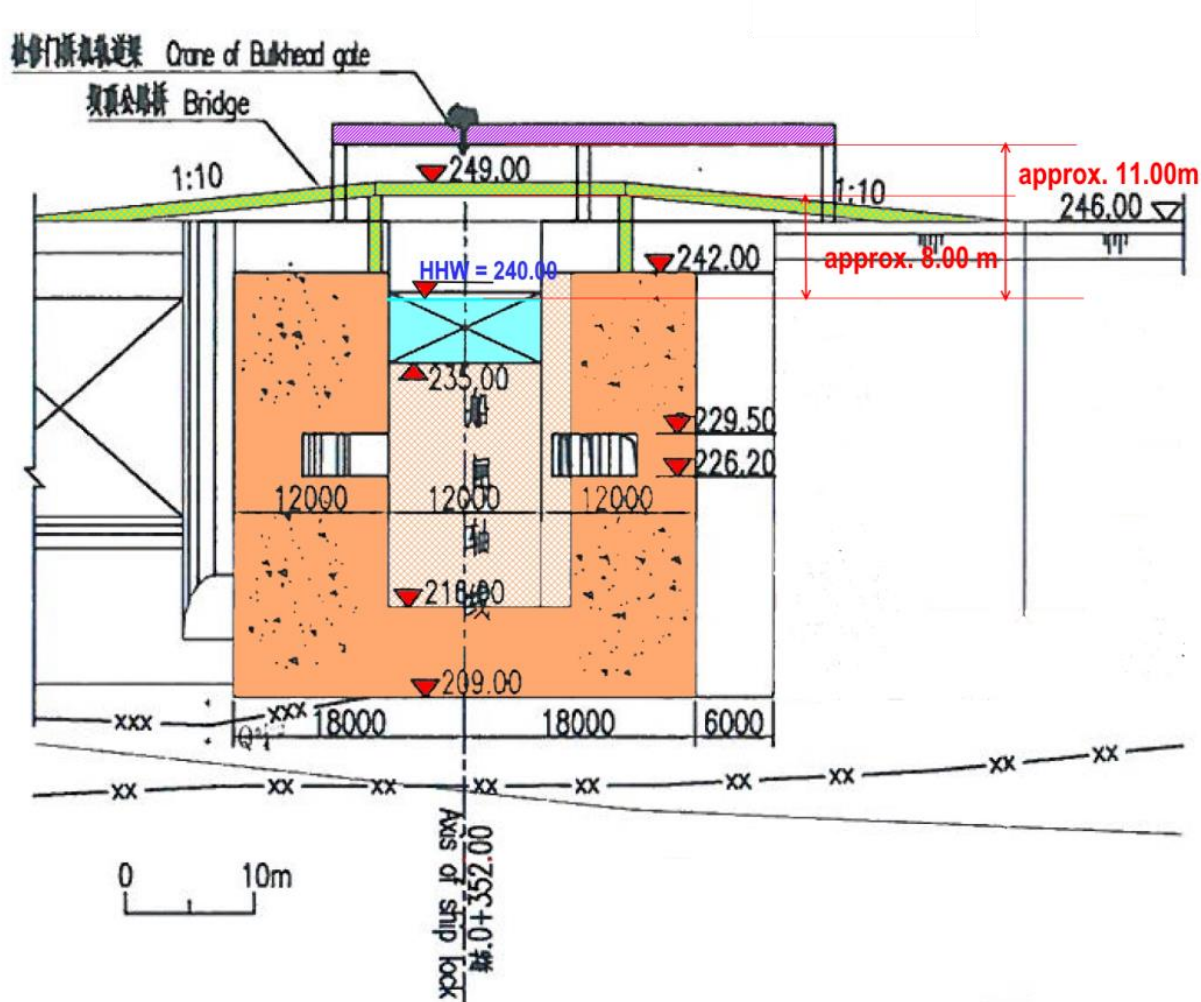
II. Main Review Findings (4)

Lock design, structure and equipment:

- Low bridge over the upper lockhead, only 8.00 meters air clearance. The usual air clearance under the bridges is 10.00 meters by highest high water level;
- The available place to lodge the mechanism for the stop cables upstream the downstream miter gate is questionable. The stop-cable mechanism is to be explained in more detail.

II. Main Review Findings (5)

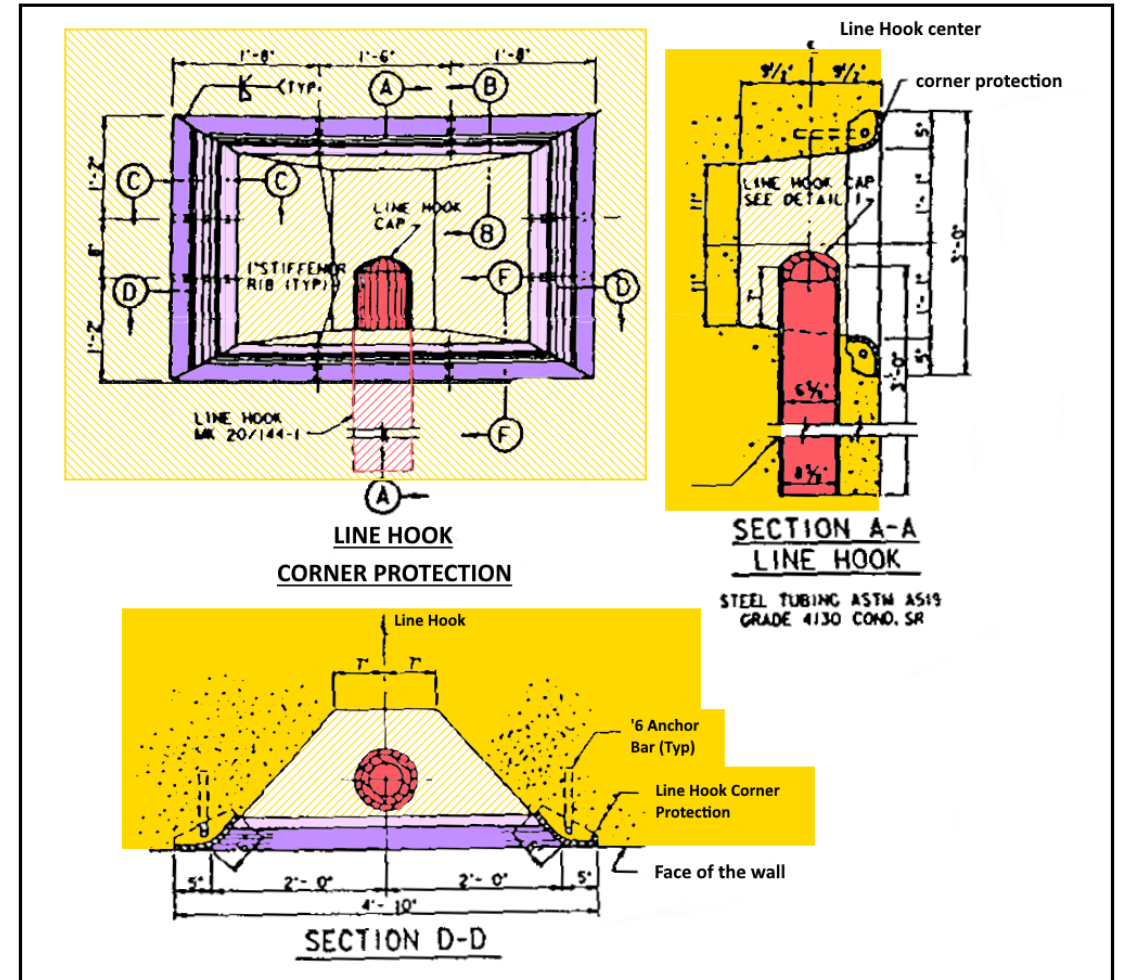
Lock design, structure and equipment:



II. Main Review Findings (6)

Lock design, structure and equipment:

- There should be line hooks in the lock chamber and the guidance walls at various levels, adjacent to the ladders;
- At least one additional ladder in the upper and lower guidance walls outside the chamber are recommended.

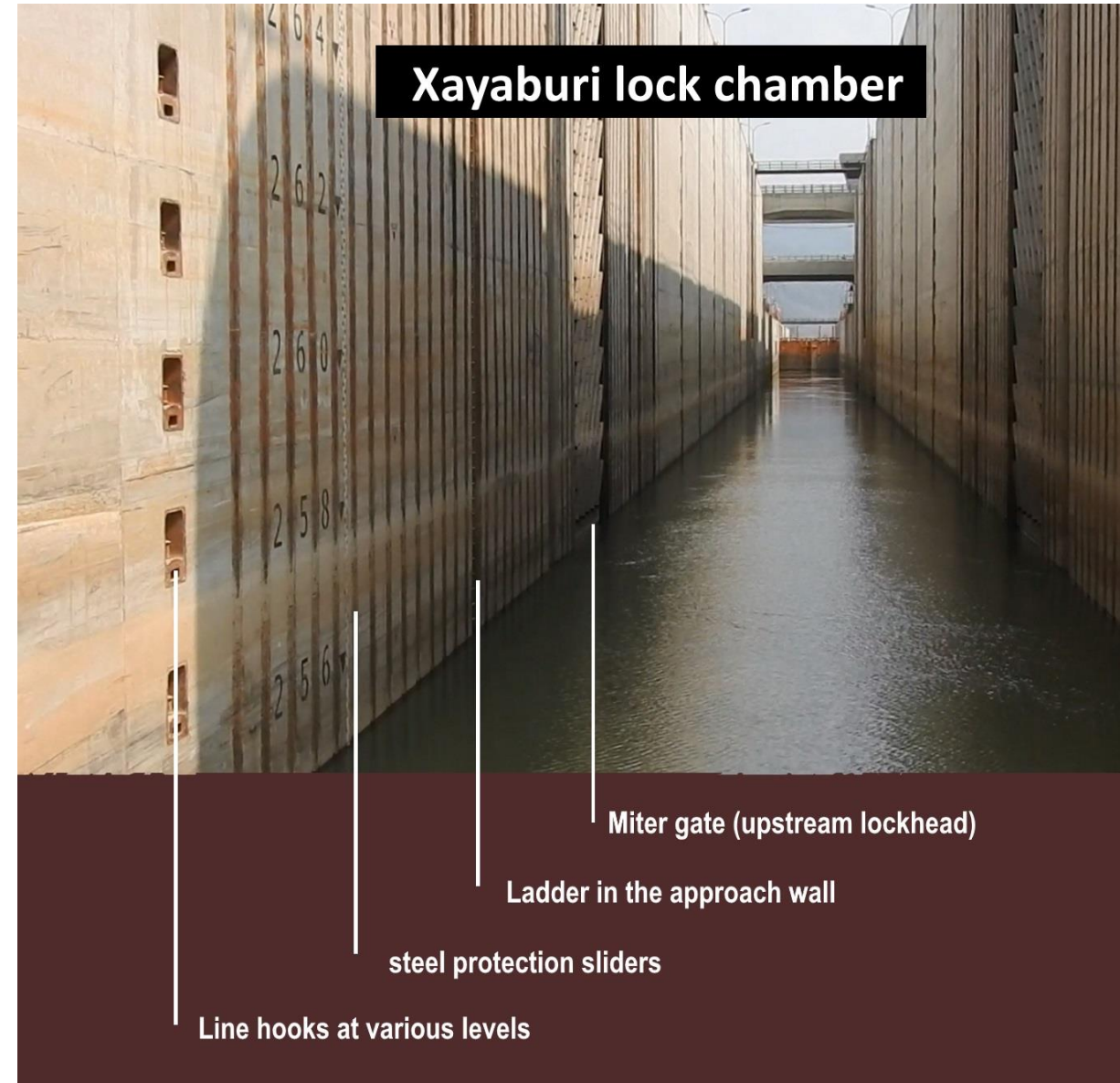
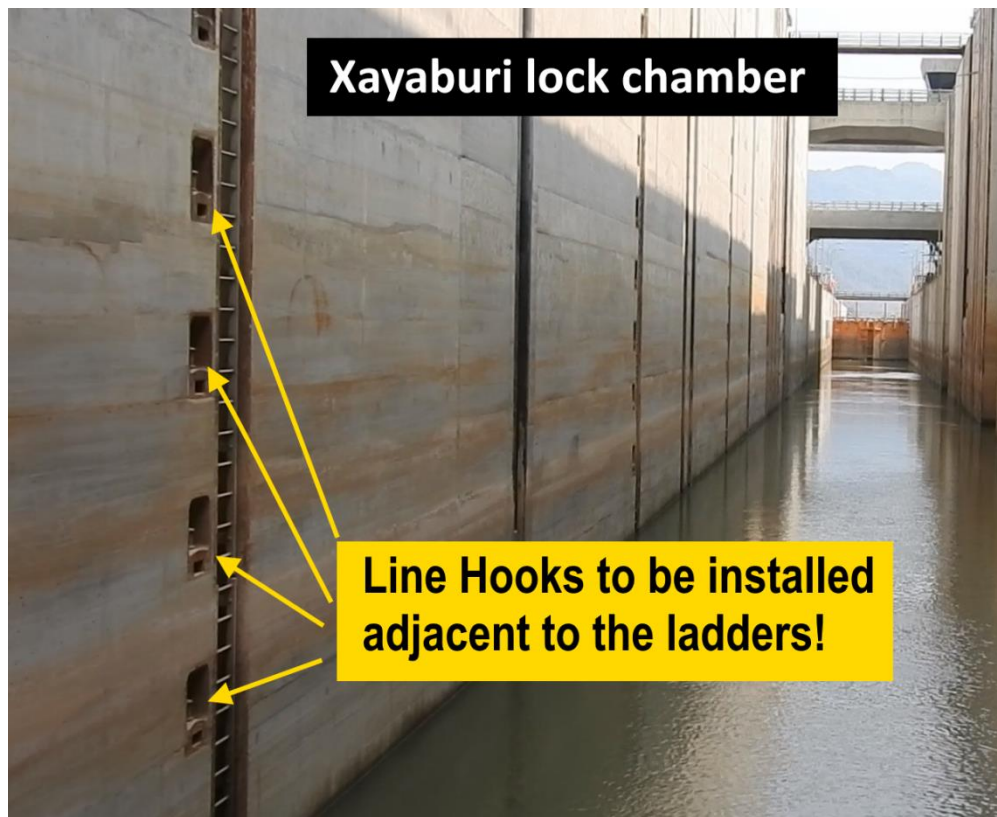


Line hooks at various levels inside the lock chamber

II. Main Review Findings (6)

Lock design, structure and equipment:

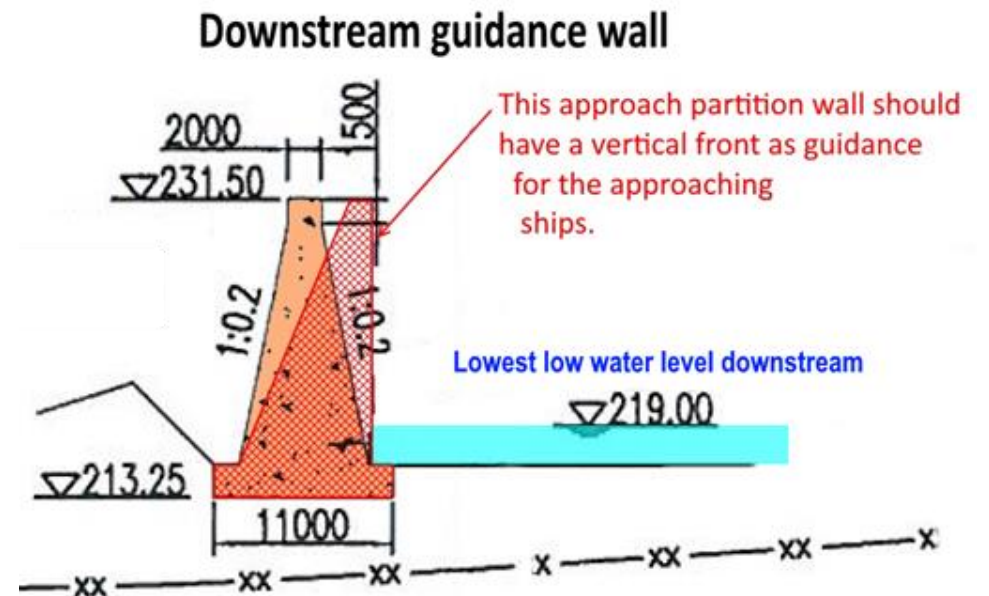
These pictures shows the various lock chamber wall features to be installed



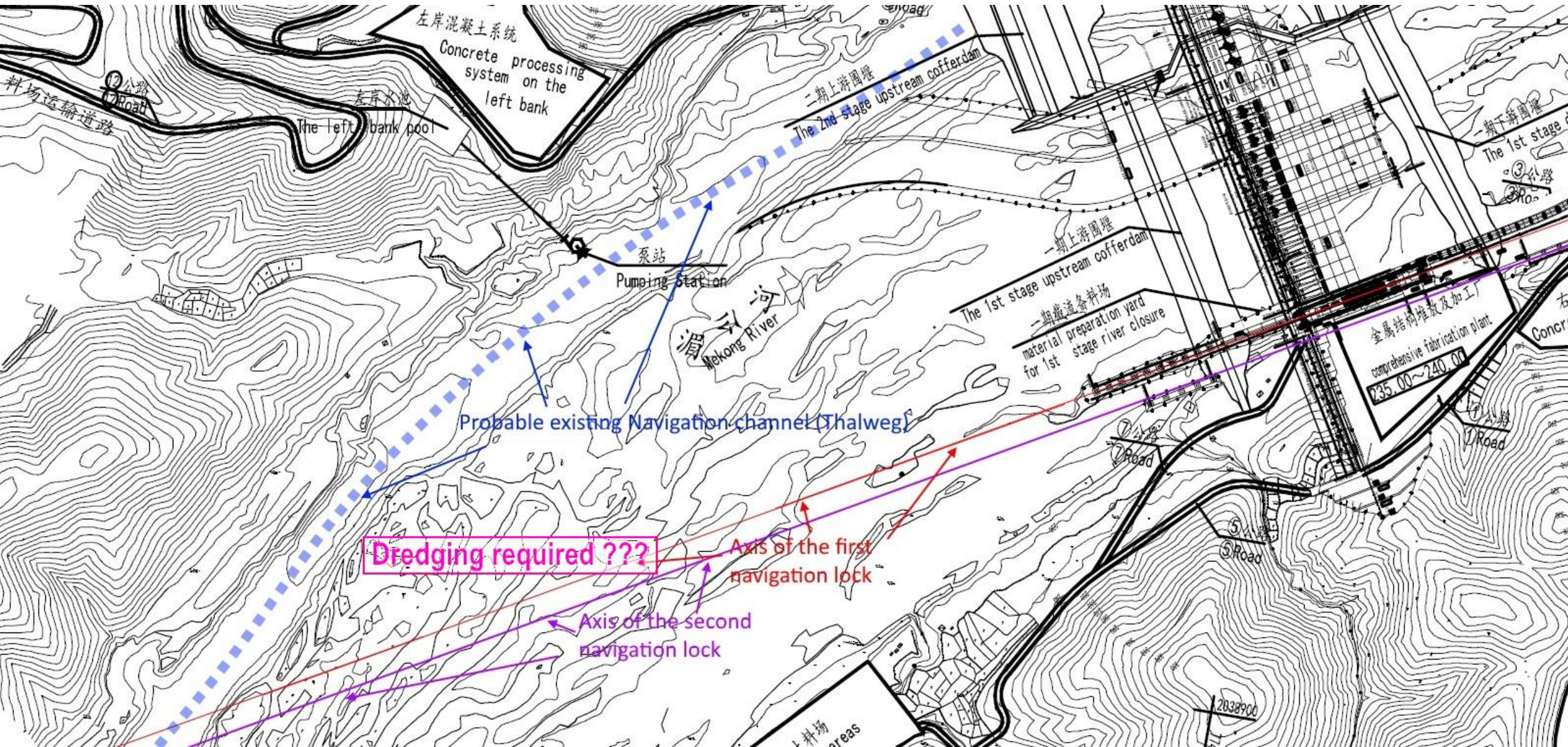
II. Main Review Findings (7)

Navigational aspects of approaches:

- The ship lock is situated at the right river bank, which is a shallow area of the river. The current navigation channel is on left
- The area for the second ship lock and its axis has not been clearly defined and is not shown on the drawing
- No clear plan or drawing indicating the actual and future the ship-lock
- The downstream guidance wall doesn't have a vertical front as is the case with the upstream guidance wall



II. Main Review Findings (8)



II. Main Review Findings (9)

Developer's situation plan superposed on the Google Earth picture, showing the new navigation channel will be over a very substantial length in shallow area (dry rocky land during low water season)



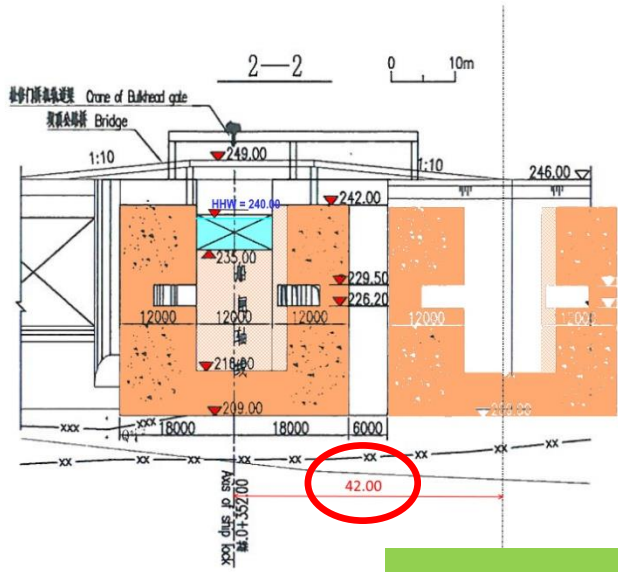
II. Main Review Findings (10)

Navigational aspects of approaches:

- It is expected that additional excavation works will have to be done downstream on the right bank to improve nautical access to the ship lock.
- It is likely that the downstream navigation channel will have to be excavated in the “free-flow” area as the existing navigation channel is on the left bank. However, this is not outlined in the drawings provided and there is no hydrographic survey stretching far enough downstream;
- The 5 dolphins up- and downstream will be an obstacle at the entrance to the future second ship lock, which will be parallel at approximately 42 meters;
- No clear road connection to the downstream lock head.

II. Main Review Findings (11)

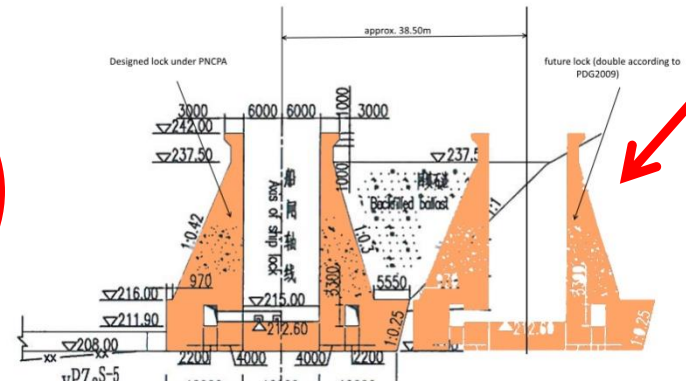
SECOND SHIP LOCK ALIGNMENT AT RIGHT BANK



Second lock!

42.00

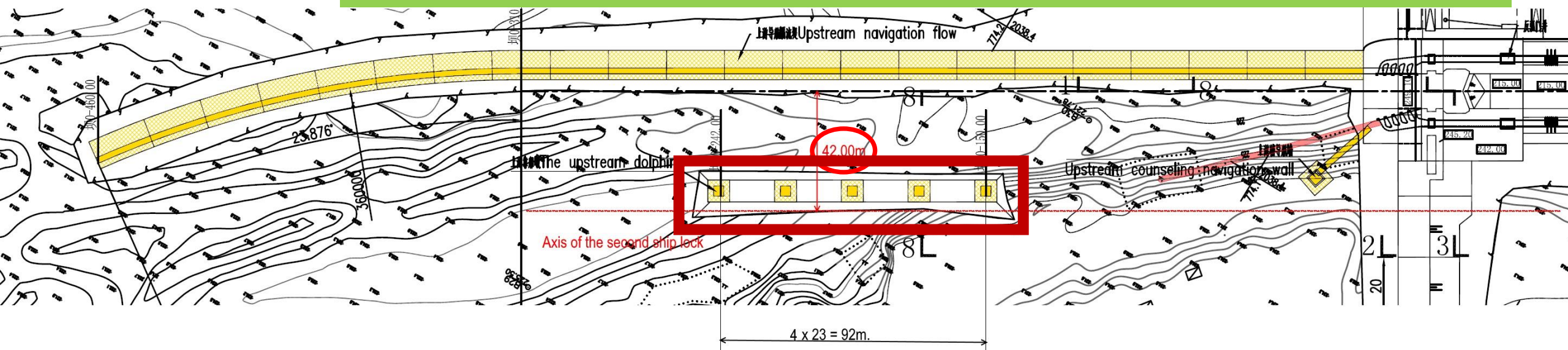
Future lock (PDG2009)



Second lock!

UPSTREAM APPROACH CHANNEL

OBSTRUCTING THE APPROACH TO THE FUTURE SECOND SHIP LOCK!!!

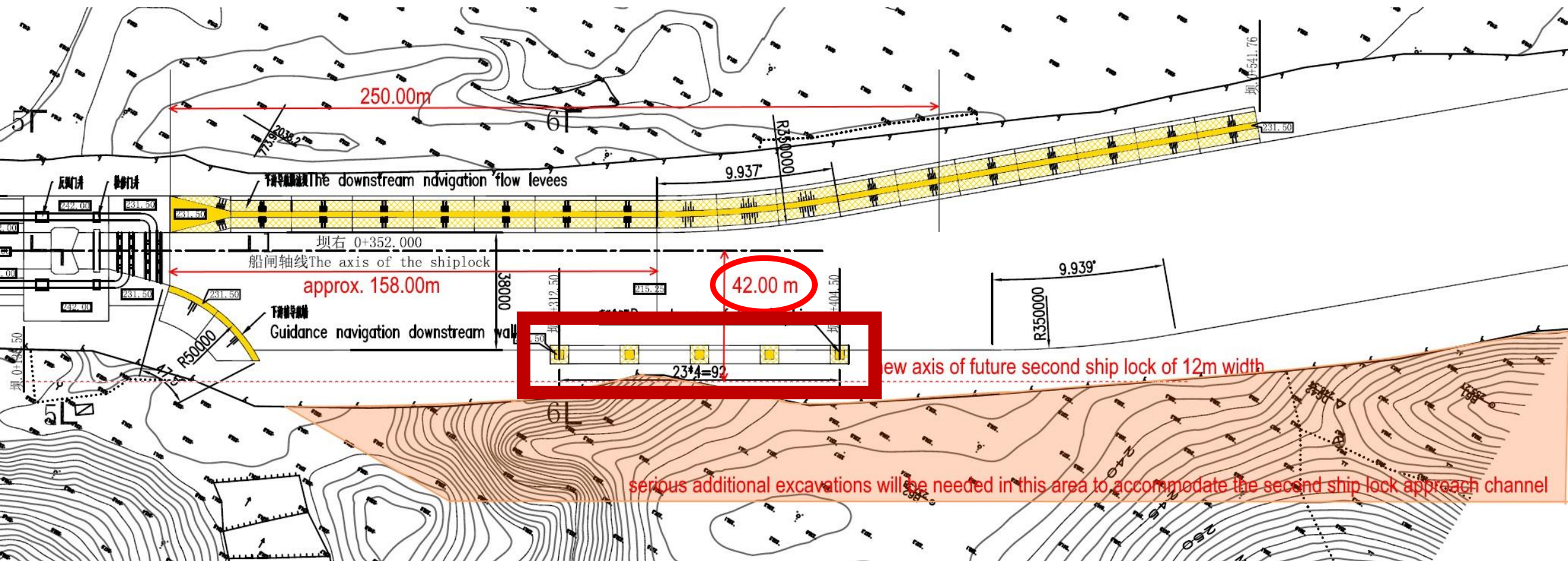


II. Main Review Findings (12)

Navigational aspects of approaches:



extra excavations to improve nautical access



OBSTRUCTING THE APPROACH TO THE FUTURE SECOND SHIP LOCK!!!

II. Main Review Findings (13)

Filling and Emptying system:

- **The shorter the lockage time, the greater the turbulences and dangerous flow patterns, especially for small vessels.** It is more important to ensure safe locking than faster locking. The developer should outline these issues in the report.
- Recently the recommendations don't pay much importance/weight to the lockage time, but rather emphasizes safety during filling of the lock chamber.
- **With speeds of 12.0 - 14.0 m/sec during filling and emptying the chamber there may be a danger of cavitation.** This eventual problem should be properly addressed.

II. Main Review Findings (14)

Operation, Safety and Maintenance

- It is advised to provide fish passage structure[s] through the miter gates during idle navigation time
- Provision of an emergency overhead rolling crane (to remove floating or sunken heavy debris; to position the bulkheads in their recesses for setting miter gates and tainter valves dry for repair, inspection or maintenance) would certainly be a welcome asset.



Photo taken at the Schleuse Müden ship lock on the Moesel. Many fish are attracted by the flow downstream the shiplock.

September 2018

III. Recommendations (1)

1. Increase the height of the bridge over the upper lock head and the rolling crane (minimum 10.00m);
2. Adapt ladders and floating bollard; provide enough space for stoppage cable;
3. Clearly define the area for the second ship lock including its approaches;
4. Improve (dredge?) and provide Nav aids to the upstream navigation channel which has to cross in front of the powerhouse and spillway;

III. Recommendations (2)

5. Reconsider the locations of the 5 dolphins up- and downstream that will hinder the entrance to the future second ship lock;
6. The downstream guidance wall should have a vertical front;
7. Redesign the downstream navigation channel including additional excavation works to accommodate future second shiplock access;
8. Road connections to all parts of the ship lock, also to the downstream lock head.

Thank you

