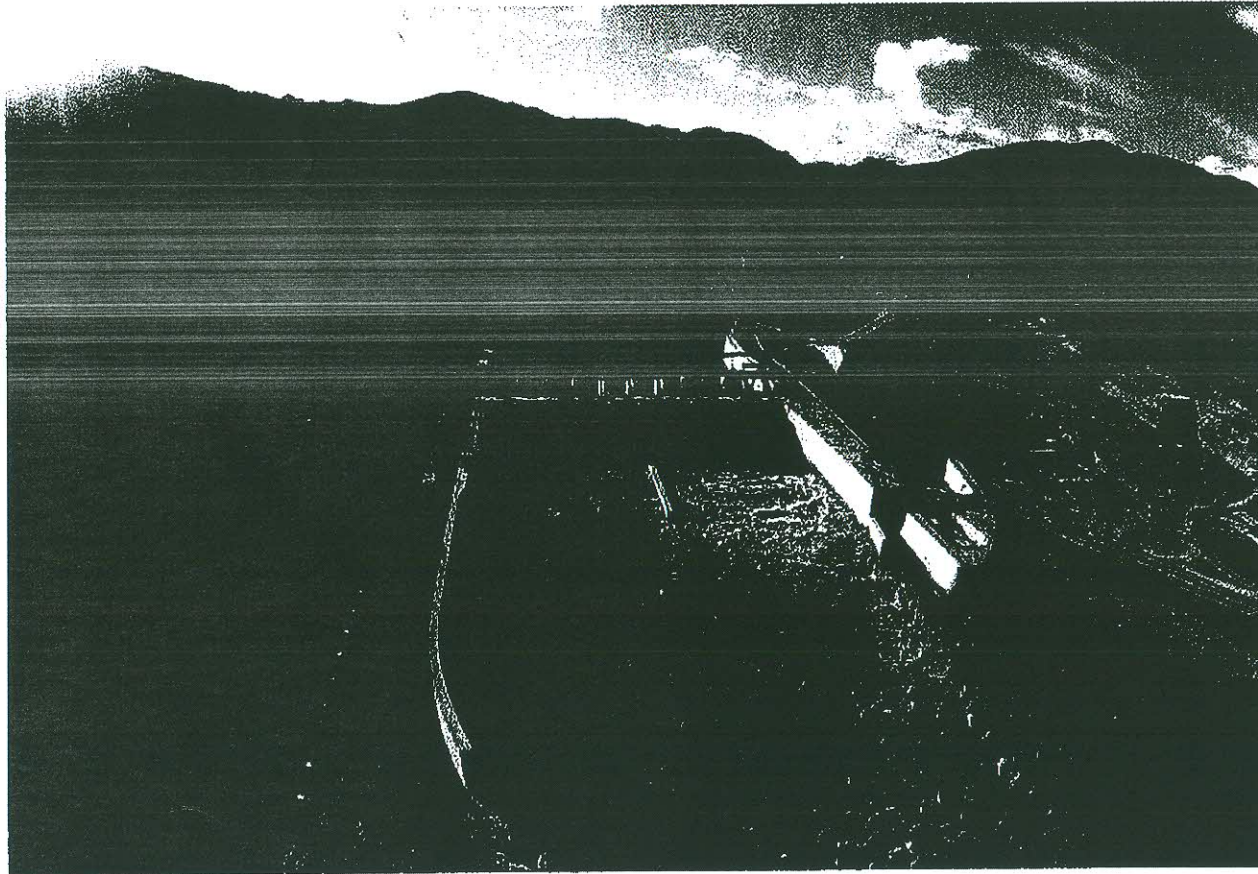

XAYABURI HPP – DESIGN CHANGES



CONTENT

1. Project key data
2. Spillway
3. Navigation Lock
4. Intermediate Block
5. Powerhouse
6. Fish passing facilities

Pöyry Energy Ltd.

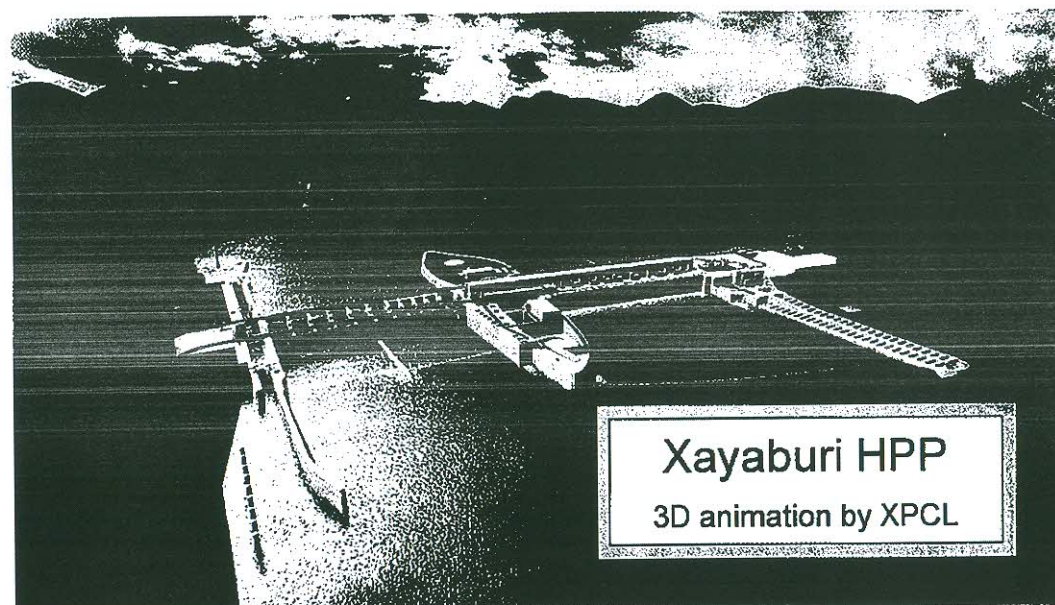
Knut Sierotzki

Hydro Power & Renewable
knut.sierotzki@poyry.com

1. PROJECT KEY DATA

First stage construction

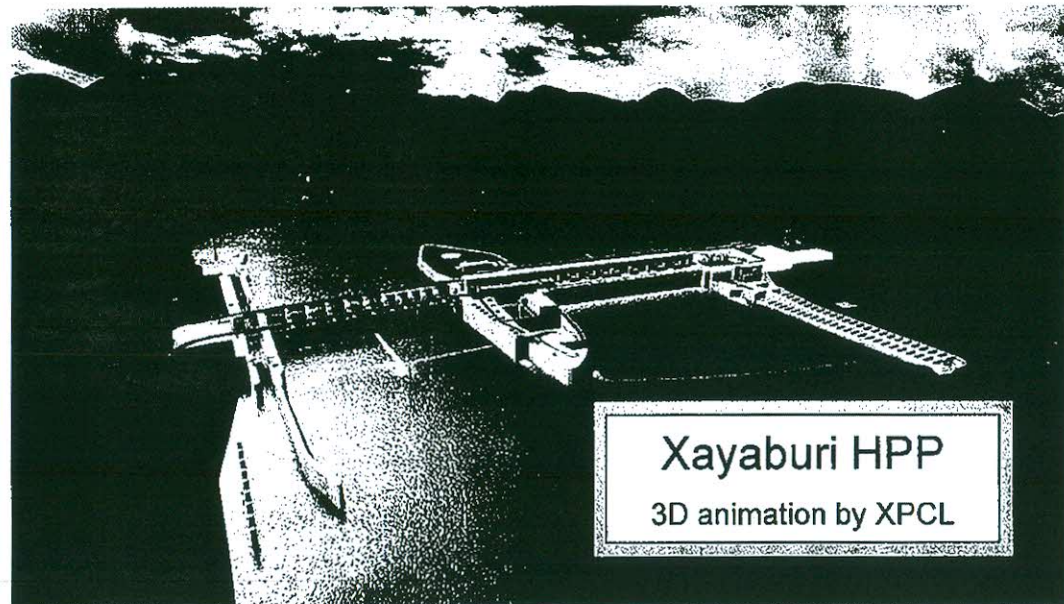
- Spillway
 - 7 surface spillway bays & 4 low level outlets
 - PMF: 47'500 m³/s
- Navigation Lock
 - Two chambers, total length 320m (w/o guide walls), 12m width
 - 1'000 ton vessels
- Intermediate Block
 - 530m long, 120m wide
 - Two pumping stations



1. PROJECT KEY DATA

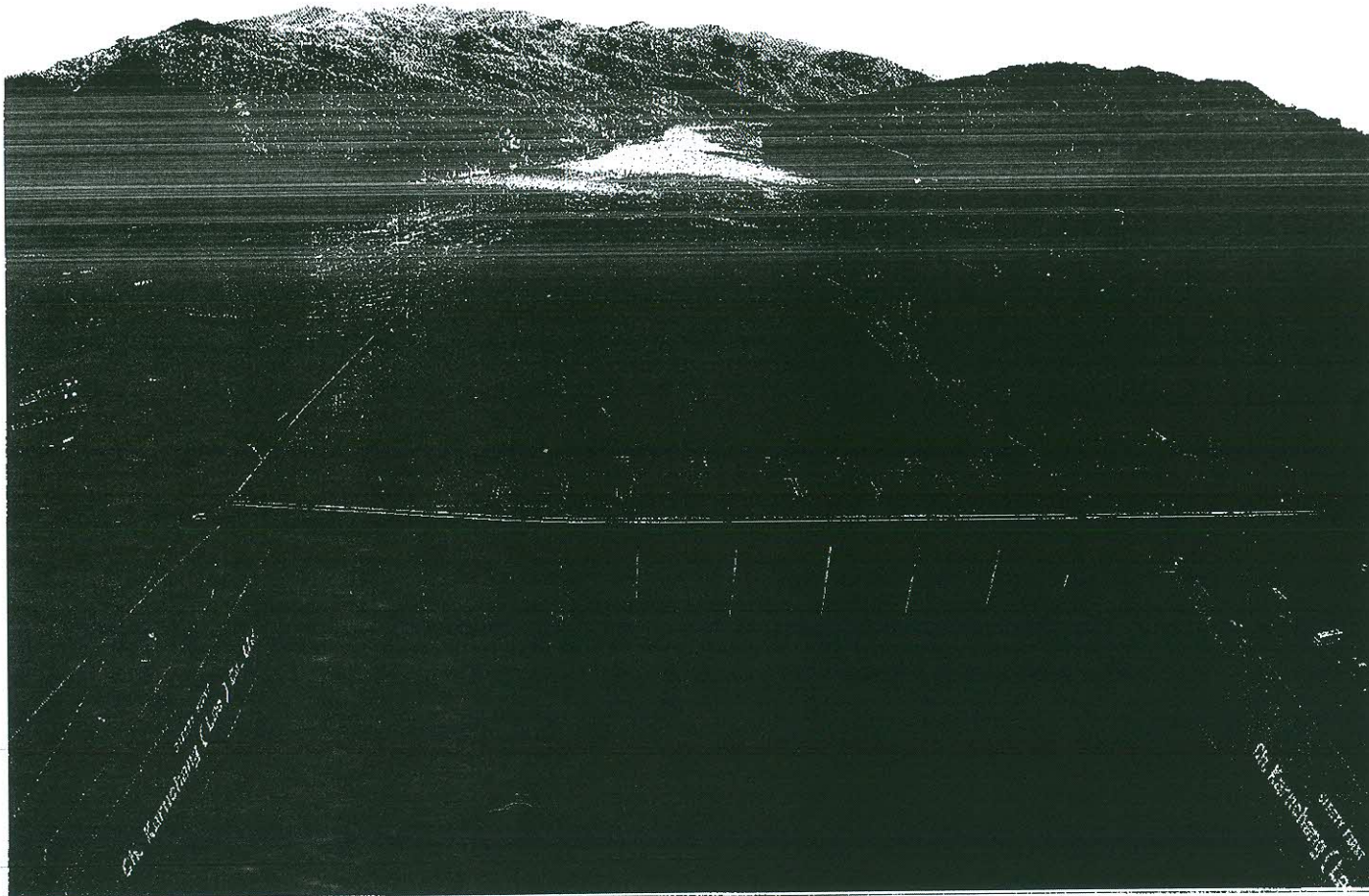
Second stage construction

- Powerhouse
 - 7 EGAT + 1 EdL vertical Kaplan units: 1285 MW
 - Discharge: 5'140 m³/s
 - Rated head:
- Fish passing facilities
 - Auxiliary Powerhouse
 - 2 x 4 MW
 - 2 x 20 m³/s
 - PS1: 160 m³/s
 - PS2: 120 m³/s
 - Fish ladder: 265m



2. SPILLWAY

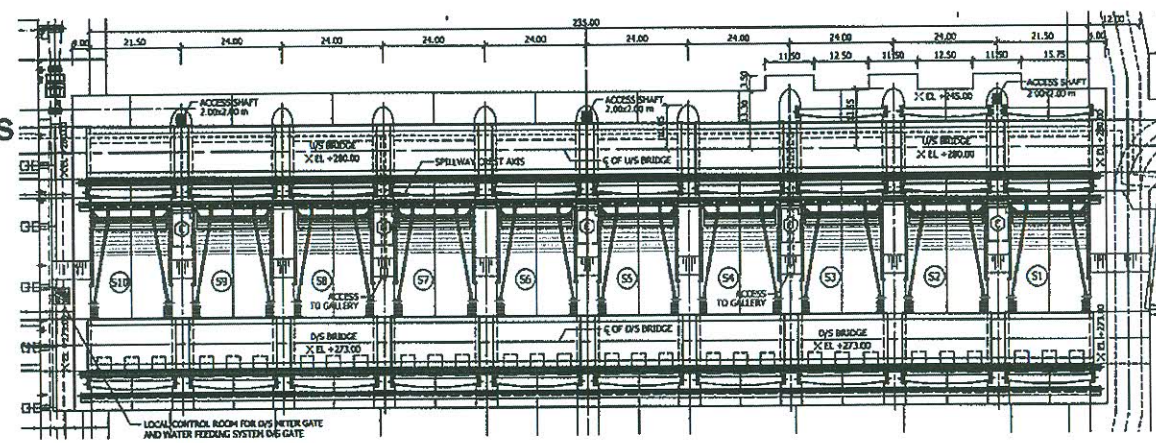
Status Oct. 2015



2. SPILLWAY

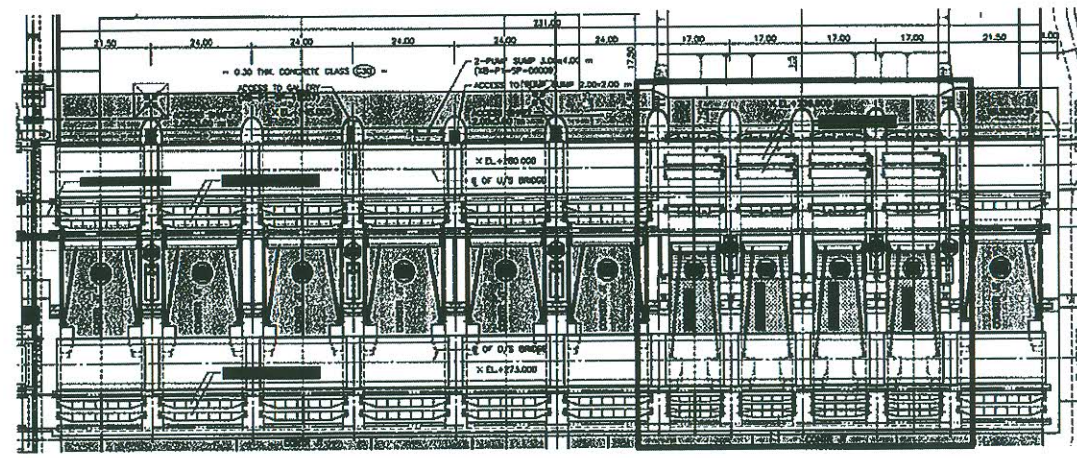
Outline Design

- Width 235m
- 10 surface spillway bays



Modified Outline Design

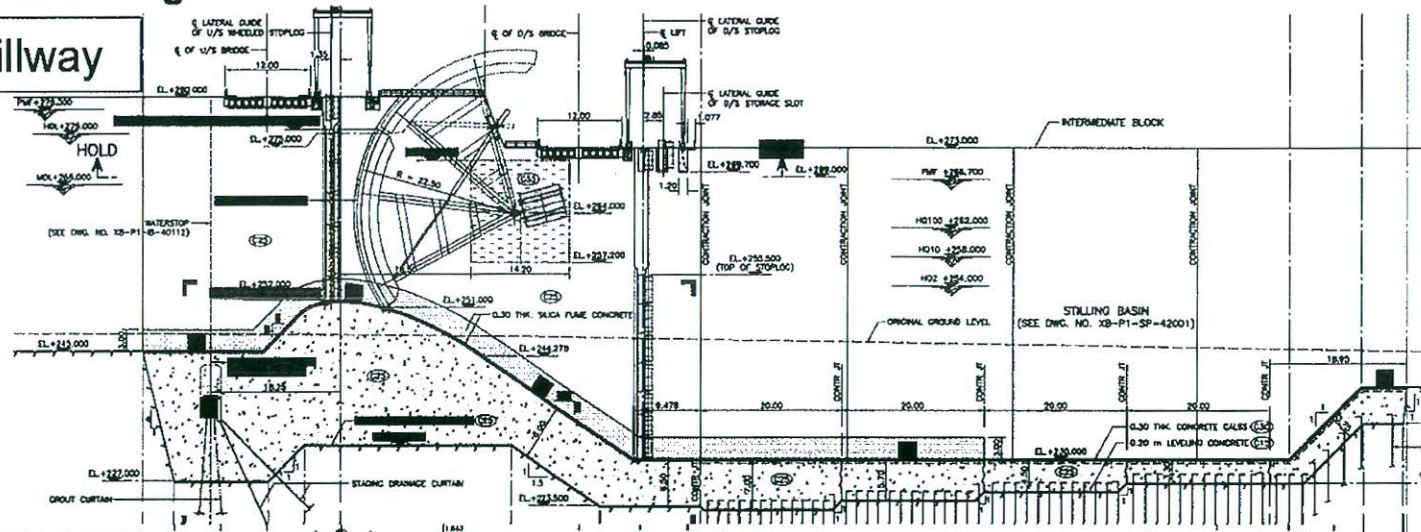
- Width 231m
- 7 surface spillway bays
- 4 low level outlets



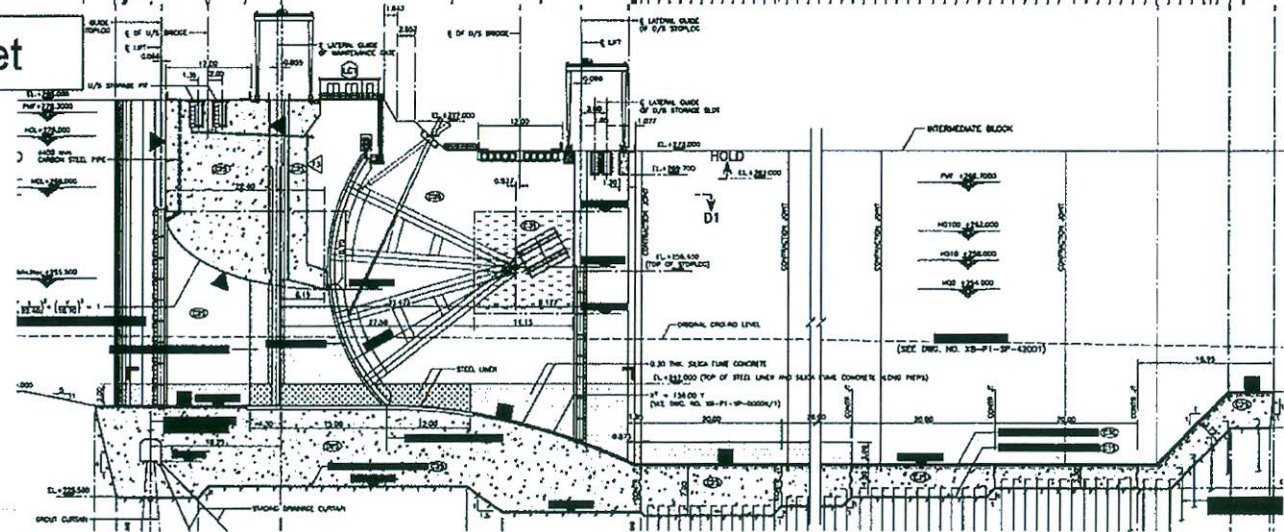
2. SPILLWAY

Modified Outline Design

Surface Spillway

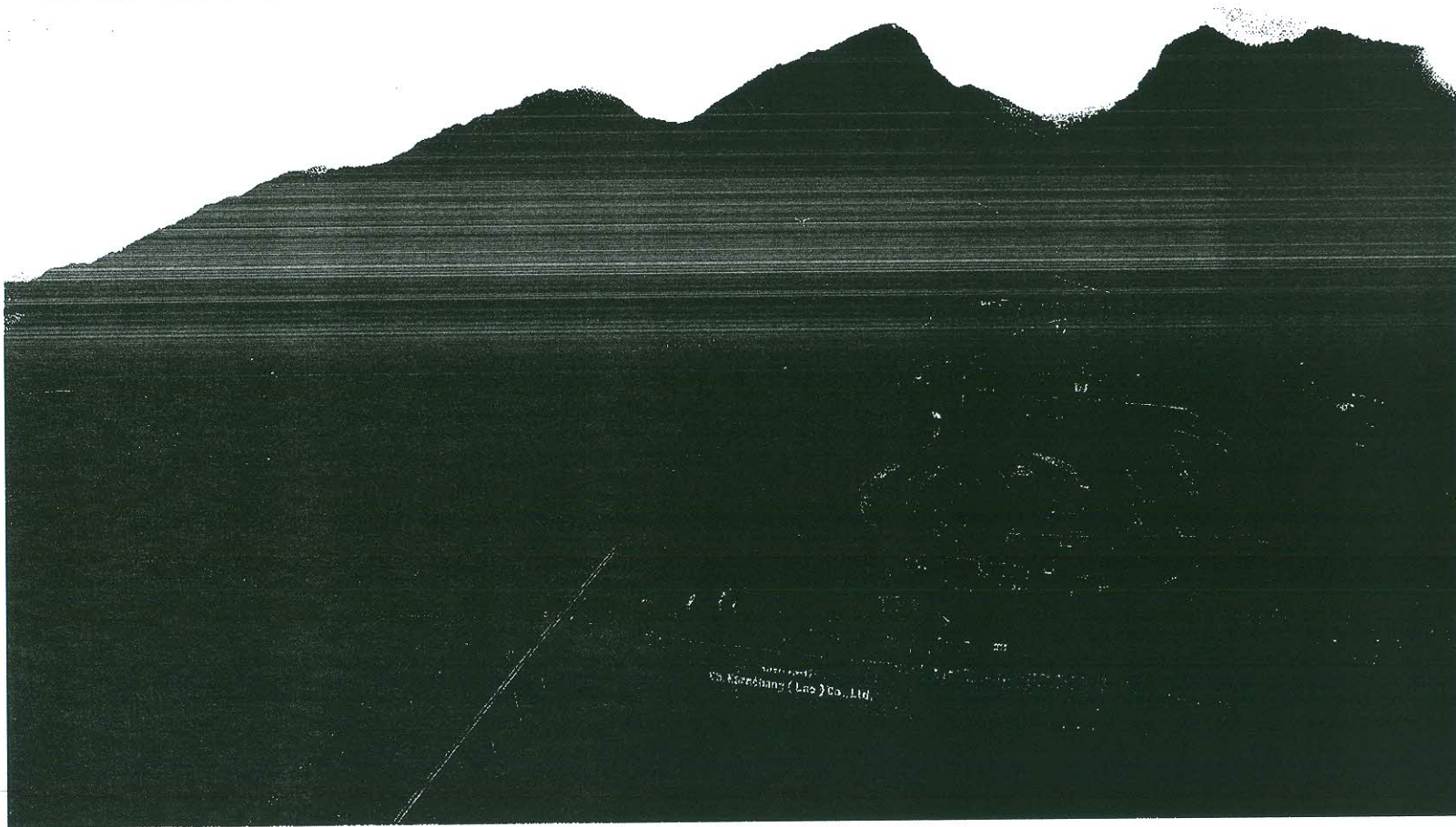


Low level outlet



3. NAVIGATION LOCK

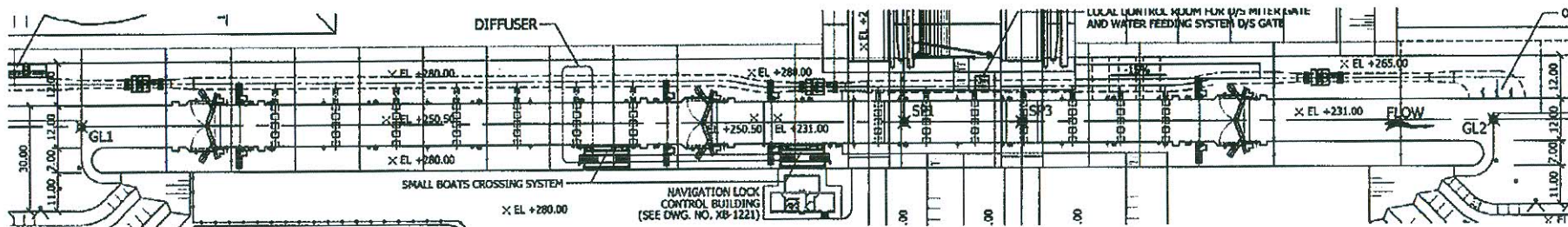
Status Oct. 2015



3. NAVIGATION LOCK

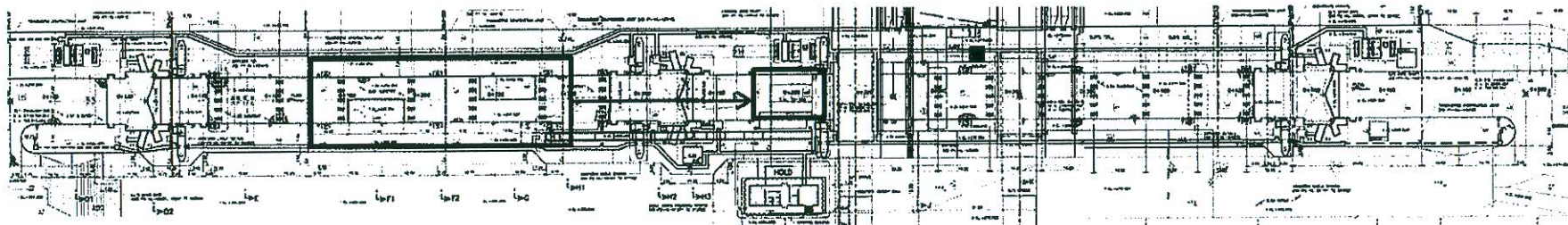
Outline Design

- Length main structure & guide walls: 470m +260m



Modified Outline Design

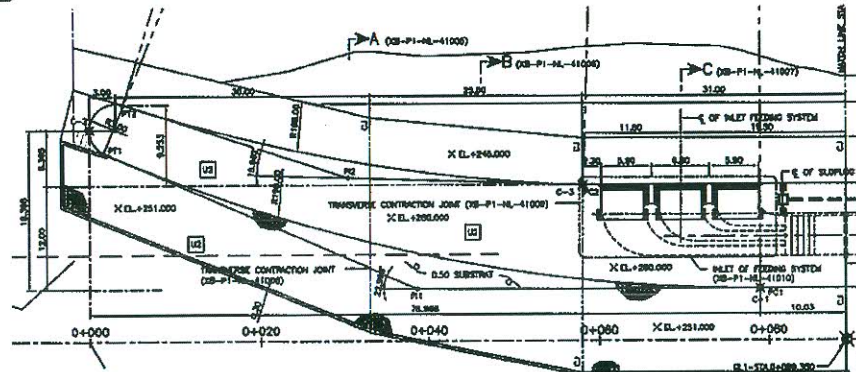
- Length main structure & guide walls: 405m +300m
- Attraction flow system for fish passing during construction
- Modifications guide walls



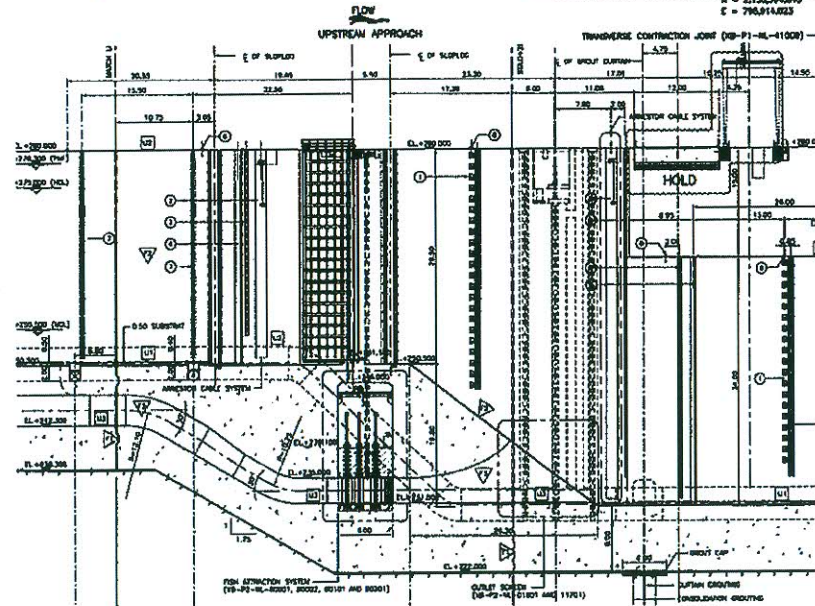
3. NAVIGATION LOCK

Modified Outline Design

u/s guide wall



Fish attraction



4. INTERMEDIATE BLOCK

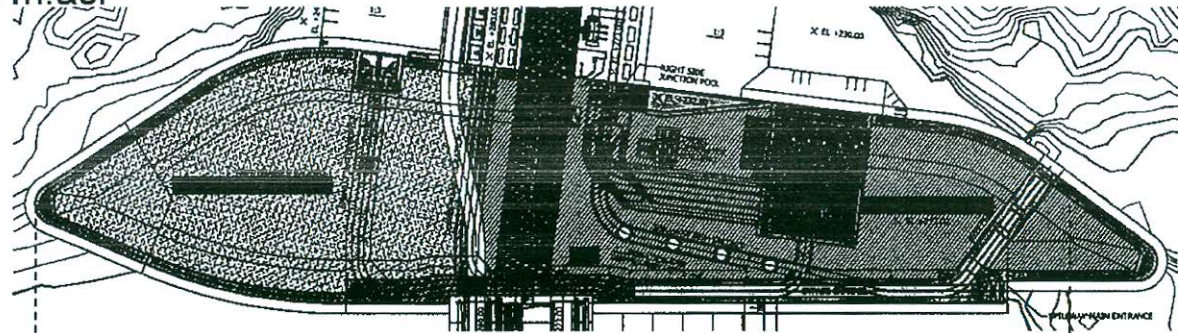
Status Jan. 2016



4. INTERMEDIATE BLOCK

Outline Design

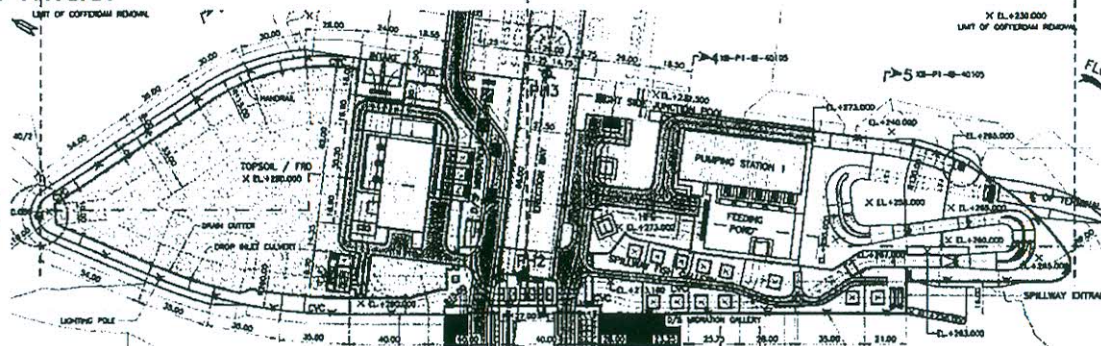
- Length: 610 m
- d/s foundation el. 225.0 m.asl
- d/s block el. 273.0



Modified Outline Design

- Length: 530 m
- d/s foundation el. 235.0 m.asl
- d/s block el. 255-265

- **Significantly reduced concrete volume**



5. POWERHOUSE

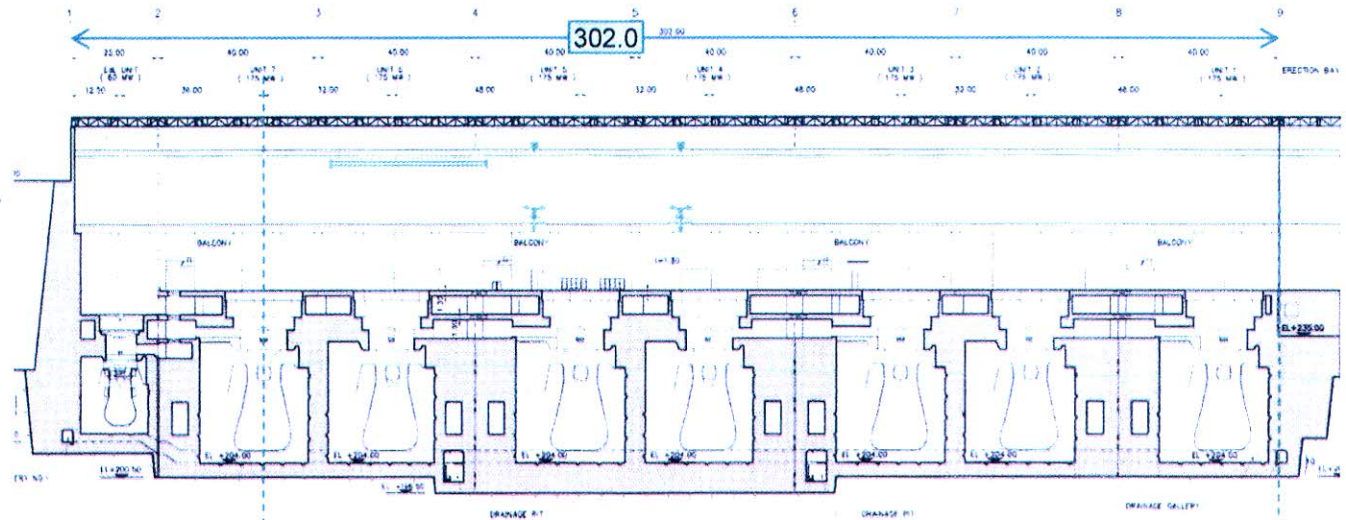
Status May 2016



5. POWERHOUSE

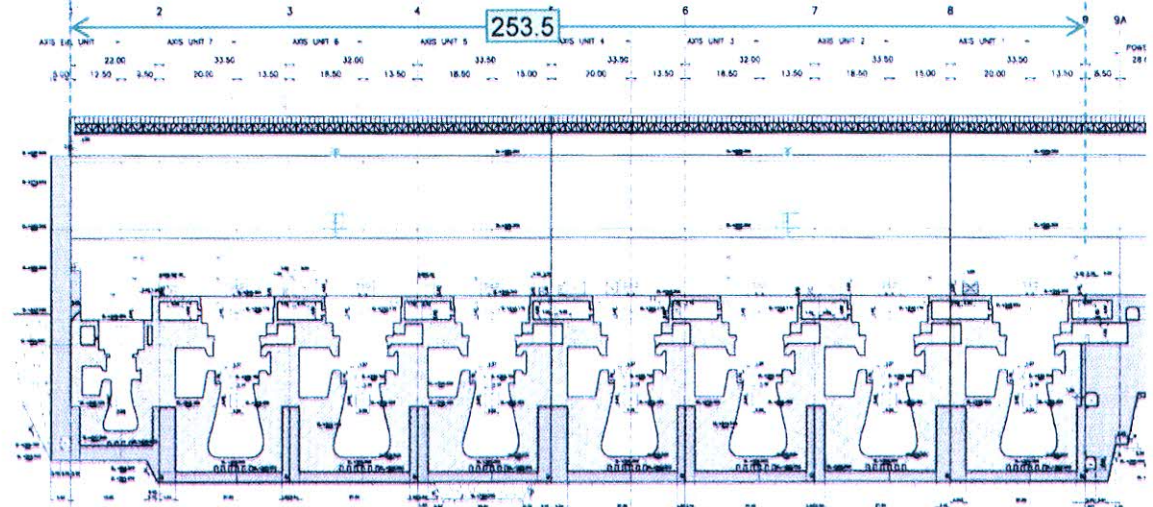
Outline Design

- Length 302.0m
- Sand flushing o.



Modified Outline Design

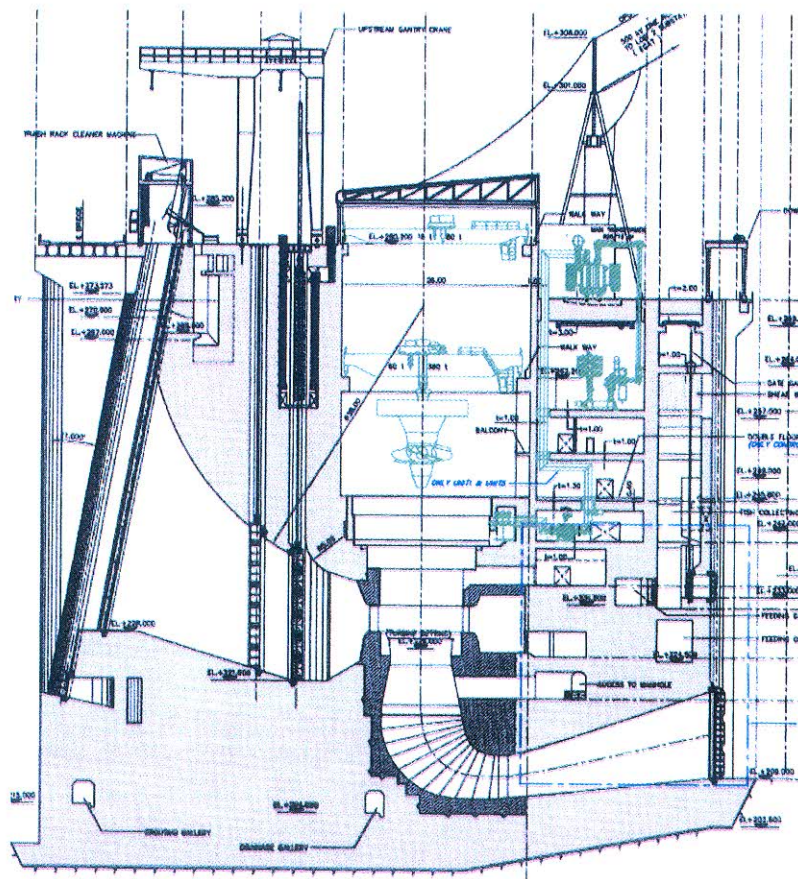
- Length 253.5m
- No sand flushing outlets
- Shorter construction
- Shear walls
- Other improvements and cost reductions



5. POWERHOUSE

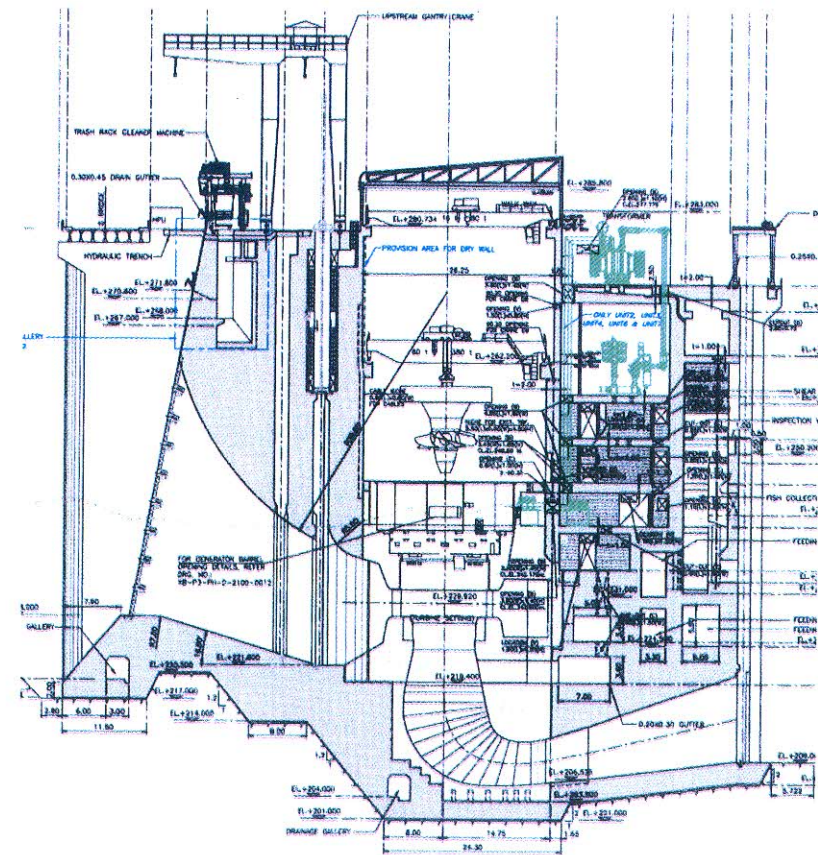
Outline Design

- Sand flushing outlets



Modified Outline Design

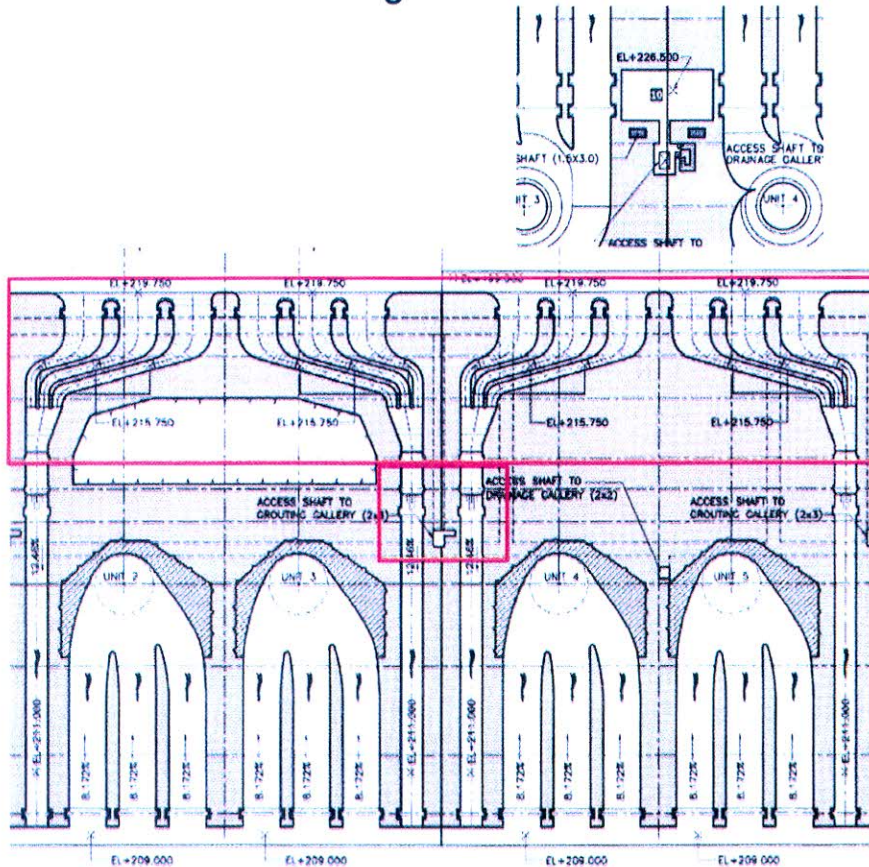
- Omitting sandflushing outlets leads also to an optimization of the foundation



5. POWERHOUSE

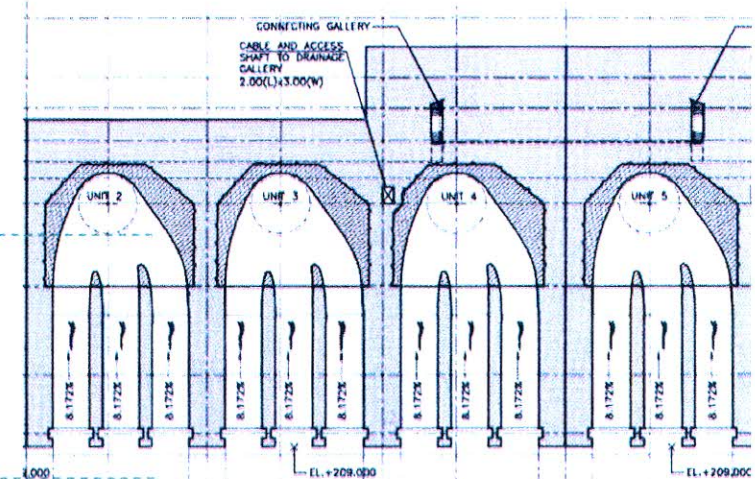
Outline Design

- Sand flushing outlets



Modified Outline Design

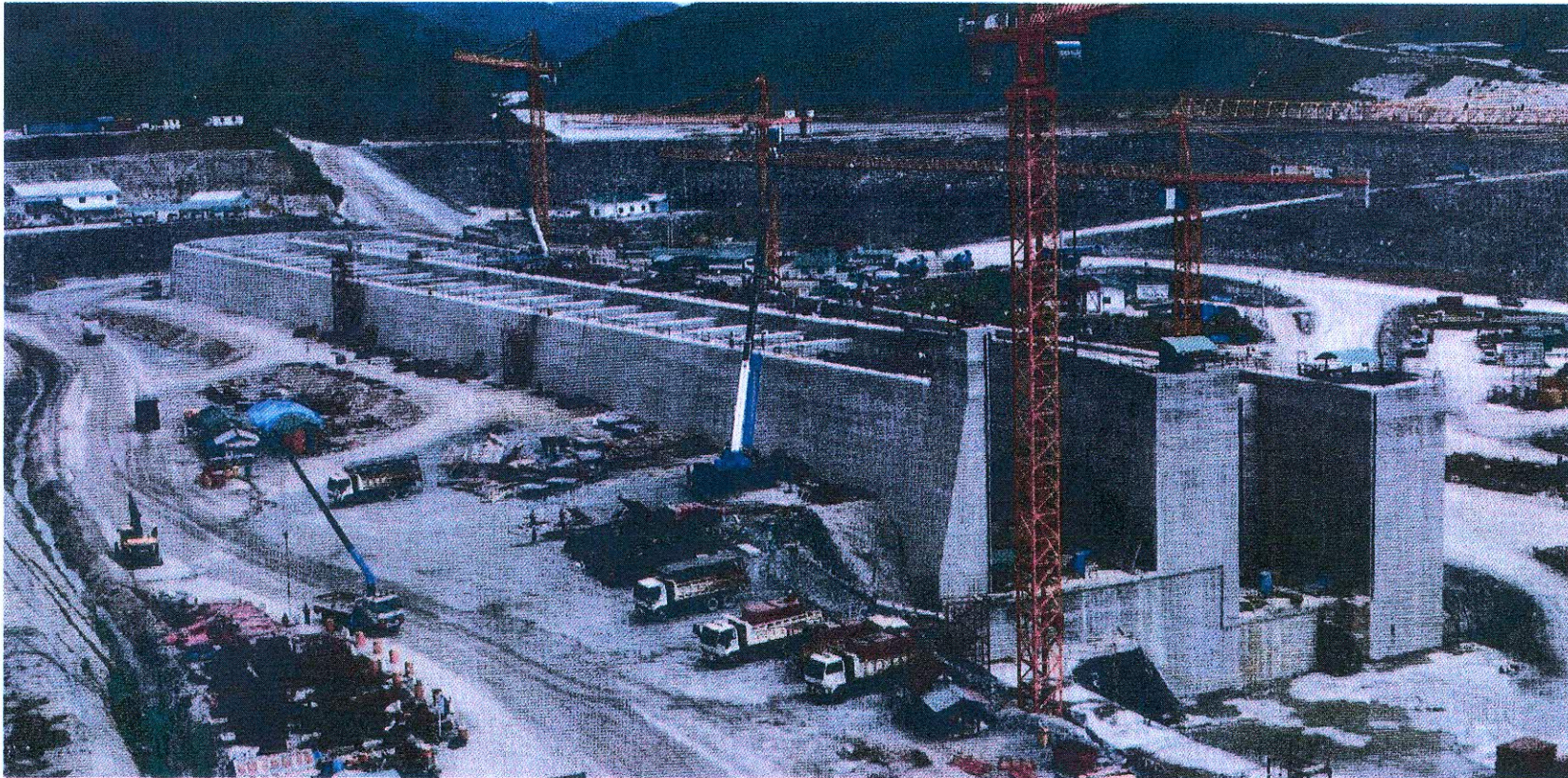
- Omitting sandflushing outlets leads to:
 - Less hydromechanical works
 - Shorter PH (perpendicular to flow)
 - Optimized foundation
 - Shorter construction time



- Feasible construction schedule
- Significantly reduced cost

6. FISH PASSING FACILITIES

Status Jun 2016



6. FISH PASSING FACILITIES

Fish u/s migration

- Attraction flow fish ladder: left bank auxiliary Powerhouse
- Attraction flow at Powerhouse and IB: PS1 (dry season), gravity water supply (wet season)
- 2 Fish lock
- 1 Fish lift (optional)

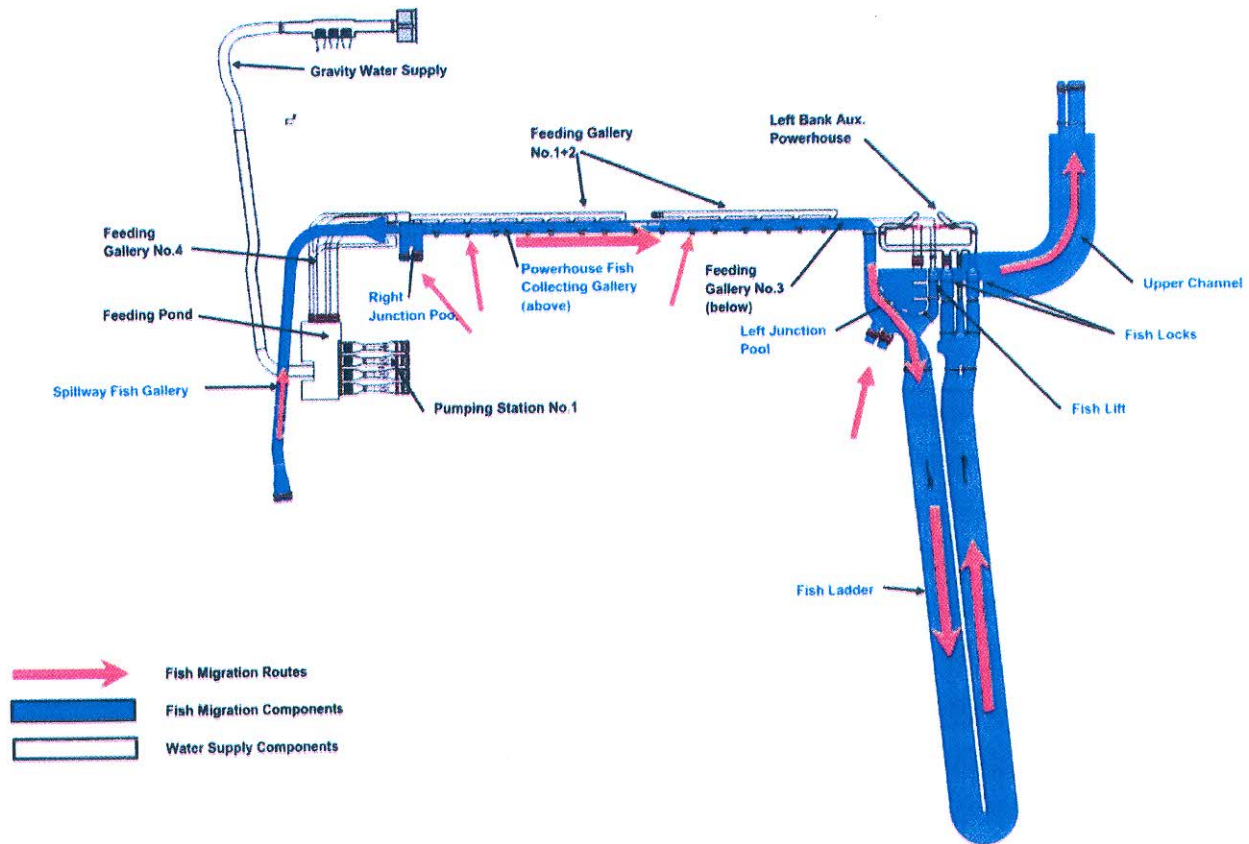
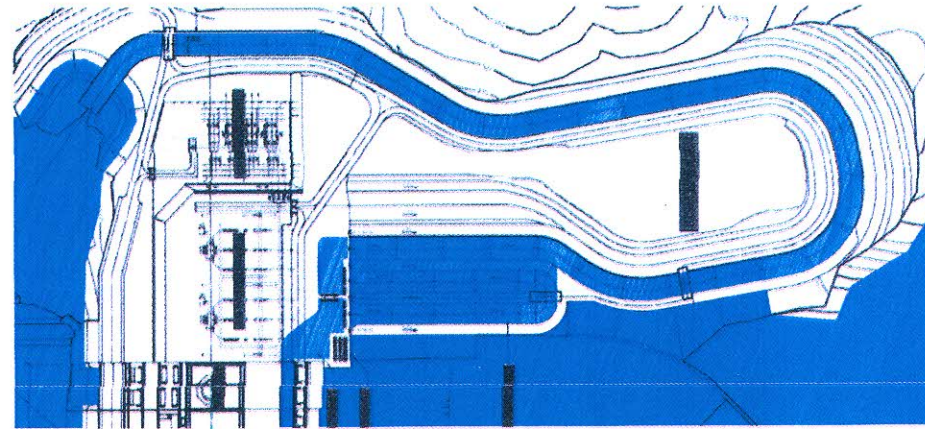


Figure 2-1 Upstream Migration Facilities – General Arrangement

6. FISH PASSING FACILITIES

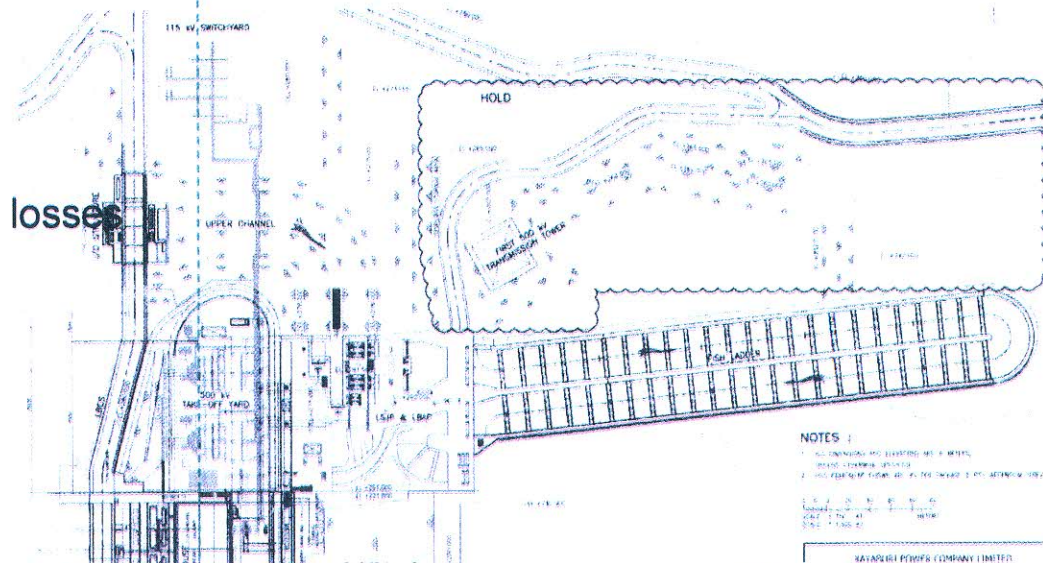
Outline Design

- Lower loop: 180m, 5%
- Fish ladder: 610m, 4.5m



Modified Outline Design

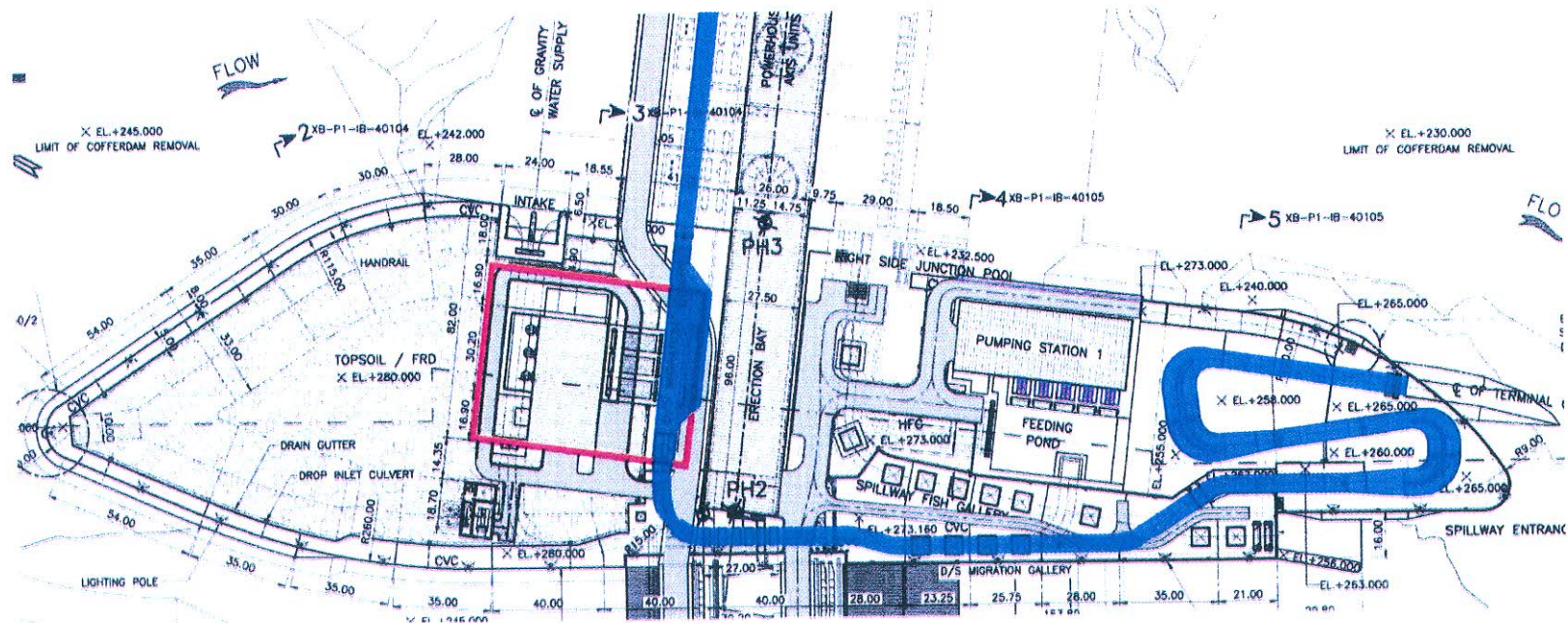
- LBAP: 8MW
 - Less water and power production losses
 - Fish ladder: 525m, 1.2%
 - Upper channel: 110m
 - 2 fish lock
 - 1 fish lift (optional)
- **Probability that the fish u/s migration works has been increased significantly.**



6. FISH PASSING FACILITIES

Fish d/s migration

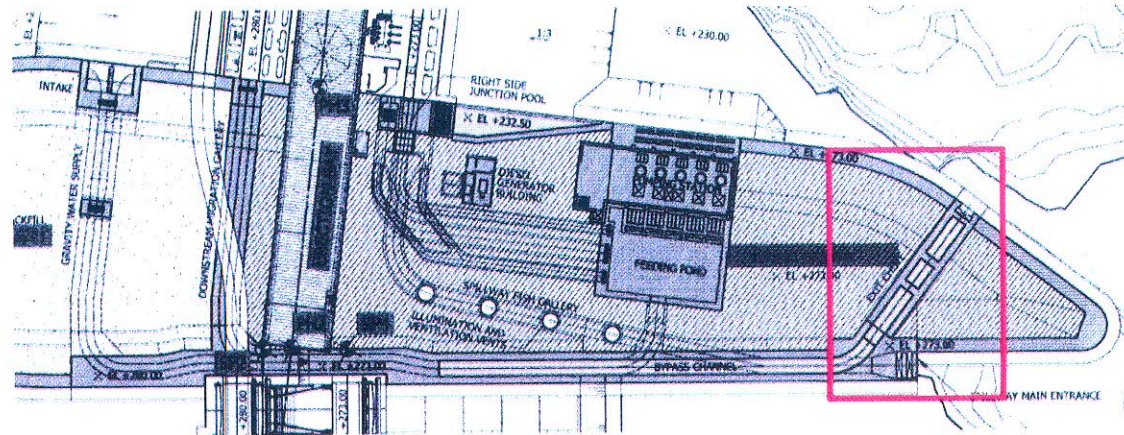
- Attraction flow u/s Powerhouse: PS2 (dry season), fish d/s migration channel (wet season)
- Exit chute
- Fish resting area
- Light openings



6. FISH PASSING FACILITIES

Outline Design – d/s migration

- Straight terminal chute



Modified Outline Design – d/s migration

- S-shaped terminal chute with basins
 - Pumping station 2
 - Fish resting pool
- Fish will survive the d/s migration
- Fish d/s migration can operate the entire year

