



Feitsui Reservoir

The Guardian of the Greater Taipei Area Water Resource.



Photo provided by Sinotech Engineering Consultants Inc. & Ltd.

Profile of Feitsui Reservoir

Basic Data of Feitsui Reservoir

- **Gross Initial Storage:** 406,000,000 m³ (at Water Surface El. 170 m)
- **Effective Storage Capacity:** 335,510,000 m³
- **Watershed Area:** 303 km²
- **Reservoir Area:** 10.24 km² (at Water Surface El. 170 m)
- **Normal High Water Surface:** El. 170 m
- **Maximum High Water Surface:** El. 171 m
- **Probable Maximum Flood (PMF):** 10,500 cms

Dam Facilities

- **Dam Type:** 3-centered double curvature variable thickness concrete arch dam
- **Dam Height:** 122.5 m
- **Dam Length:** 510 m
- **Crest Elevation:** Non-overflow Section: El. 172.5 m
Overflow Section: El. 161 m
- **Design Flood Discharge at PMF:** 9,870 cms
 - Spillway:** 8 Bays, Radial Gate (Each width 14.0m, height 9.3 m), designed capacity: 7,670 cms
 - Sluiceway:** 3 Sets, Fixed-wheel Gate (Each width 2.5m, height 3.0m), designed capacity: 700 cms
 - Tunnel Spillway:** Diameter 10m, Length 297.25 m, designed capacity: 1,500 cms
- **Auxiliary Dam Elevation:** Non-overflow Section: El. 87.5 m
Overflow Section: El. 76 m
- **Plunge Pool:** Length 168 m, Width 83-116m, Depth 24-33 m
- **River Outlet:** 1 block of Howell-Bunger valve Diameter 1.4 m, 47 cms
- **Power Plant:** 1 unit, installed capacity 70 MW



Taipei City Government
Taipei Feitsui Reservoir Administration (TFRA)

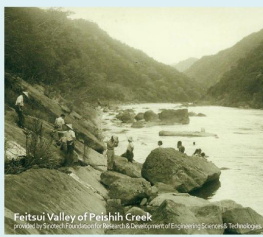
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Reservoir Construction

1 Origin

Since 1970s, the intensive urban development in the greater Taipei area has contributed to the increasing water demand and encountered serious water shortages especially during drought period. Therefore, the government proposed to construct a reservoir for all the people living in Metropolitan Taipei for both short-term and long-term water demand. Due to the great geology and abundant water of Peishih Creek, Feitsui Gully of Peishih Creek is the best site to construct the Feitsui dam.



Peishih Valley of Peishih Creek
Photo by Science Education Policy & Development of Engineering Sciences & Technology

2 Planning & Designing

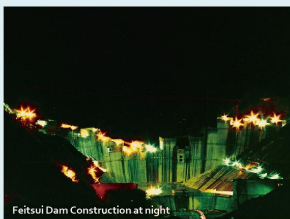
After a series of primary planning, feasibility planning, additional research and final research, the dam site was confirmed safe. The Feitsui Reservoir project was approved by Executive Yuan in January, 1979. The Construction Commission was established by Taipei City Government in May of the same year. It was responsible for pushing the construction of Feitsui Reservoir and authorized Taiwan Power Company to take charge of the project. The dam was then designed and supervised by Sinotech Engineering Consultants, Ltd. and built by Ret-Ser Engineering Agency (RSEA). The dam, a milestone in hydraulic engineering of Taiwan, is the first large arch dam designed and constructed completely by domestic companies.



Model Testing for Feitsui Dam

3 Construction

Feitsui Dam is a 3-centered double curvature variable thickness concrete arch dam, which was under construction from August 1979 to June 1987. Approximately 5 million cubic meters of concrete were used in this construction and the depth of the drill hole was approx. 100,000 meters. The amount of grouting was approx. 12,000 m³. The total construction cost was approx. \$11.4 billion NT dollars.



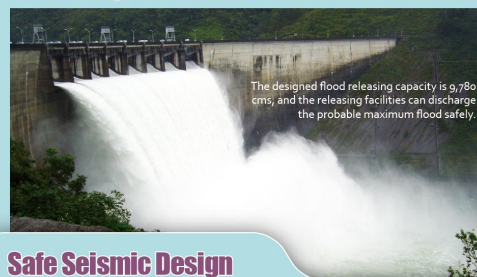
Feitsui Dam Construction at night

4 Operation & Management



The reservoir can not only meet the water demand for the people living in the greater Taipei area, but also function as power generation and flood mitigation.

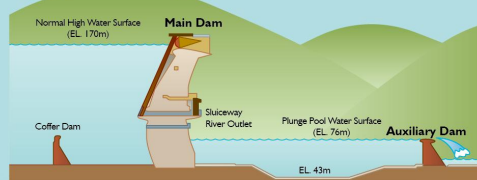
Safe Design of Flood Control



The designed flood releasing capacity is 9,780 cms, and the releasing facilities can discharge the probable maximum flood safely.

Safe Seismic Design

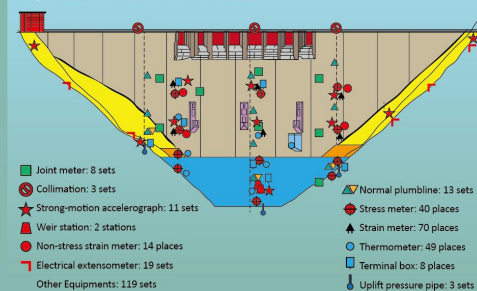
Feitsui Dam was designed to withstand any earthquake of peak ground acceleration (PGA) up to 0.4g.



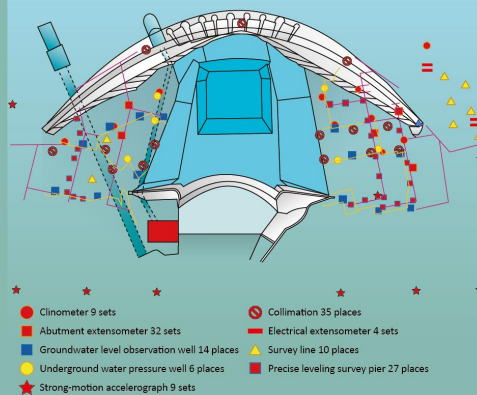
Precise Dam Safety Monitoring System

Feitsui dam is equipped with 57 types, 384 sets of instruments, such as strong-motion accelerograph, which automatically monitor and analyze the real-time situation of the dam.

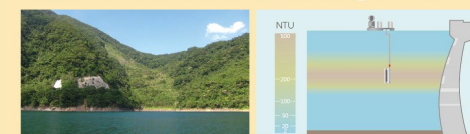
Layout of Dam Instruments



Layout of Abutment Monitoring Instruments



Professional Watershed Management



1 Soil and Water Conservation

Shotcrete, retaining walls, gabions, vegetation, and wattle fences etc. are implemented in the watershed to mitigate sediments.

2 Sediment Control Operations

The water quality monitoring system provides information for adjusting elevation for water intakes to release higher turbidity water with the purpose of reducing the amount of reservoir deposits and maintaining good water quality in the reservoir.



3 Ecological Engineering

Constructed wetlands and riparian buffers are developed around the watershed to purify the runoff from the tea farms and sanitary sewage.

4 Hydropower Operations

Feitsui hydropower plant utilizes the water resource to generate renewable electricity. The average annual revenue from the power generation is approx 439 million NT dollars.



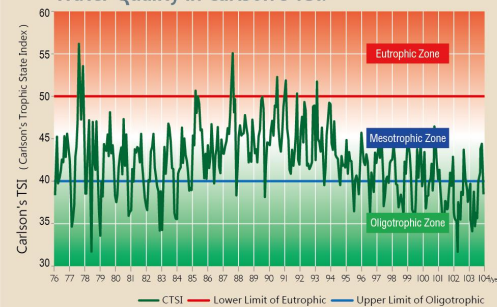
5 Ecological Monitoring and Survey

The sound ecology comes from a good watershed management. The ecology surveys around the reservoir are used for academic research, education and propagation.

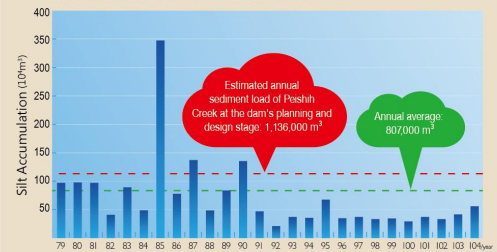
6 Ban on Pollutions

82% of pollutions within the watershed come from fishing with dumping bean cakes, tourists, agricultural cultivation, and road construction. To effectively reduce pollutions, the authority and general public should cooperate to stop from any attempted violation.

Water Quality in Carlson's TSI.



The sediment of Feitsui Reservoir



Ecology Around the Reservoir



1 Administration Building
The staff in the administration building are in charge of dam safety, reservoir operation and watershed management.



2 Meteorological Observatory
The observatory collects and monitors the meteorological data around the reservoir, such as wind velocity, wind direction, atmospheric pressure, solar radiation, evaporation, relative humidity, and temperature. The system is operated by solar power and transmitted by radio to the reservoir operations center, which serves data as basic reservoir operation.



3 Rhododendron Kanehirai Wilson
As an unique species in Taiwan, Rhododendron Kanehirai Wilson only distributes along the bank of Peishih Creek and Lutzuan. After the initial impounding of Feitsui reservoir in 1984, the species' habitat was submerged and the flowers were almost extinct in the wild. However, with the efforts of the TFPA and Taiwan Endemics Research Institute, Council of Agriculture in recent years, these beautiful flowers have already been restored successfully.



4 Water Resources Eco-education Center
This center integrates the facility of multimedia-broadcasting system, exhibition and the reservoir operations center. It also provides visitors a place to explore and learn about water conservation. The Feitsui Reservoir Environmental Learning Center has obtained the certification of the environmental education facilities from the Central Government in Nov. 2011, and is the first government authority certificated as an environmental learning agency.



5 The Fern Garden
The Fern Garden next to Eco-education Center is the first of its kind in Taiwan. The garden presents more than 130 kinds of ferns to present the evolution and the riotous profusion of ferns in Taiwan.



6 Emerald Tree Frog
In Chinese, "feitsui" refers to emerald in English. Emerald tree frog was given the Chinese name as it was first found near Feitsui valley in 1984. It has an emerald green back, golden irises, and yellow-golden skin folds behind the eyes; its robust toe pads help clinging to the branches. With aids to increase its population, we set several pottery containers to preserve its foamy eggs for breeding.



7 Pavilion
The pavilion is a midway resting place en route of the dam. It serves a good photo taking point where people can use the dam as the background. Lots of instruction signs are set here explaining the design of the dam facilities, monitoring system and safety measures to the visitors.



8 Scenic Lookout
Here is the best spot to enjoy the magnificent view of the downstream valley. You can see the whole picture of the dam and its facilities. If you bring a binocular, you may also see Crested Serpent Eagles hovering over the sky. Good Luck!



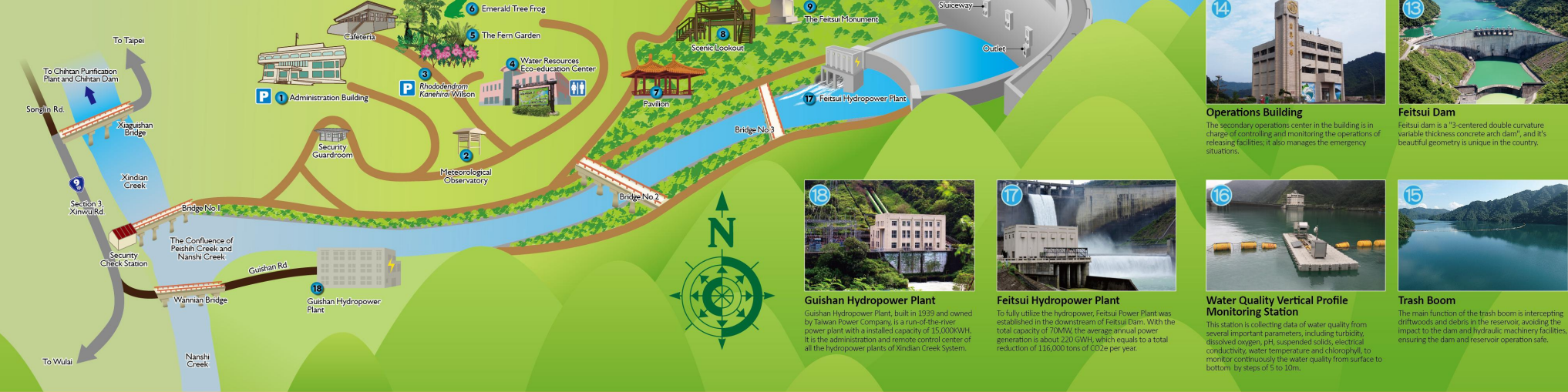
9 The Feitsui Monument
The monument was built in memory of the fifth anniversary of Feitsui Reservoir completion and operation; the inscription recorded the whole story of reservoir construction plan, the initial operating situation and the importance of supplying water for the greater Taipei area.



10 Dam Crest
In this area, you can take a view of the dam and hypower plant. You will also explore the beauty of the landscape of the valley downstream, black kite eagles hovering over the sky.



11 Dam Area Park
With the assistance of Hsi Liu Environmental Greening Foundation, the park is designed with colorful ground, streamline flower platform, flowers and trees.



12 Yellow-margined Box Turtle Wildlife Sanctuary
The sanctuary was announced officially by CDA on December 10, 2013 as an important demonstration zone for endangered Asian turtles' iborn conservation. Its objective is to protect the group of Cuora flavomarginata, Mauremys mutica, as well as other sympatric animals, wild plants and their habitats, in order to conserve the water resources.



13 Feitsui Dam
Feitsui dam is a "3-centered double curvature variable thickness concrete arch dam", and its beautiful geometry is unique in the country.



14 Operations Building
The secondary operations center in the building is in charge of controlling and monitoring the operations of releasing facilities; it also manages the emergency situations.



17 Feitsui Hydropower Plant
To fully utilize the hydropower, Feitsui Power Plant was established in the downstream of Feitsui Dam. With the total capacity of 70MW, the average annual power generation is about 220 GWH, which equals to a total reduction of 116,000 tons of CO2e per year.



18 Guishan Hydropower Plant
Guishan Hydropower Plant, built in 1939 and owned by Taiwan Power Company, is a run-of-river power plant with an installed capacity of 15,000KW. It is the administration and remote control center of all the hydropower plants of Xindian Creek System.



16 Water Quality Vertical Profile Monitoring Station
This station is collecting data of water quality from several important parameters, including turbidity, dissolved oxygen, pH, suspended solids, electrical conductivity, water temperature and chlorophyll, to monitor continuously the water quality from surface to bottom, by steps of 5 to 10m.



15 Trash Boom
The main function of the trash boom is intercepting driftwoods and debris in the reservoir, avoiding the impact to the dam and hydraulic machinery facilities, ensuring the dam and reservoir operation safe.



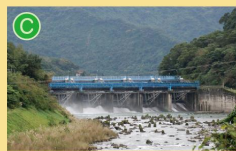
F Tsungling Power Plant, completed in 1909, is the oldest power plant in Taiwan. The tailwater then flowed to Chihitan intake for tap water use.



E Chihitan purification plant, the largest purification plant in Southeast Asia, yields more than 3,400,000 tons of tap water daily.



D After Chihitan intake collects water from Xindian Creek, the water is then distributed to Chihitan purification plant via the water tunnel.



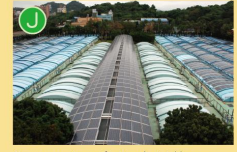
C After meeting the water demand of Chihitan Reservoir, the rest water discharged into Chingtan Weir.



B Tsungling Dam retains the water from Xindian Creek. The water is diverted to Tsungking Power Plant for power generation and part of the water flows to Chihitan reservoir for tap water use.



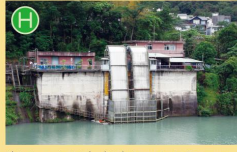
A The tailwater from Feitsui Hydropower Plant and Nanshih Creek converges at Shuangshico then flows into Xindian Creek.



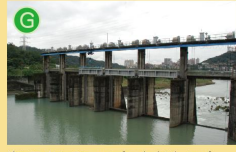
J Gongguan water purification plant yields more than 416,000 tons of tap water daily.



I Changhsing water purification plant yields more than 543,000 tons of tap water daily.



H Chingtan water intake distributes water to Gongguan and Changhsing water purification plant.



G Chingtan Weir retains water from both tailwater of Tsungking Power Plant and Xindian Creek. After utilizing the water for tap water use, the surplus water discharges to downstream river to keep the ecological base flow.



Water Supply Process

