

**Preparatory Survey on
Water Quality Improvement Project
for Japanese Bridge Area in Hoi An City**

Draft Final Report Explanation

December 2014

JAPAN INTERNATIONAL COOPERATION AGENCY
(JICA)
Nihon Suido Consultants Co., Ltd.

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I. Basic Information

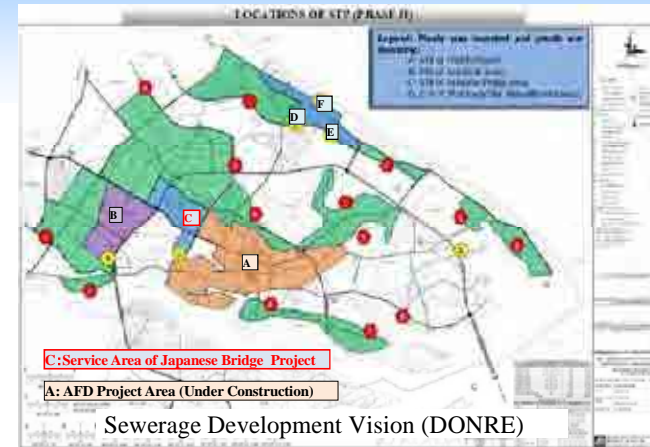
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1. Objective of the Project

- A sewage treatment plant is constructed and the Japanese Bridge Canal is rehabilitated, and treated wastewater is discharged into the Japanese Bridge Canal in Hoi An City.
- Improvement of water quality in the Japanese Bridge canal, to contribute to improve the living and sanitary conditions of citizens, and to upgrade the tourist attraction of the city.

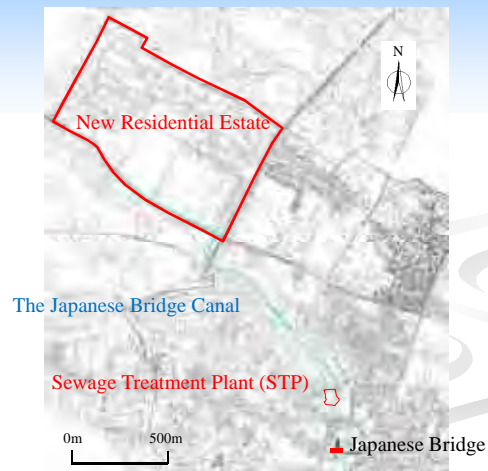
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2. Objective Area



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2. Objective Area



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3. Project Components

Item	Requested Components	Design Components
Sewage Treatment Plant (STP)	Treatment Capacity:2,000 m ³ /day (daily maximum) with sludge treatment	Treatment Capacity:2,000 m ³ /day(daily maximum) with sludge treatment Administration building (Floor area:264m ²)
The Japanese Bridge Canal	Upgrading with concrete and cover : 2.0km	Rehabilitation with concrete (partly covered and compound section) : 1.68km Dredging: 99m
Equipment Supply	A convertible truck Inspection equipment for water quality control A personal computer and a printer for data logging	A canopy truck
Soft component	-	Operation and Maintenance Guidance of STP Maintenance Guidance of the Japanese Bridge Canal Sewerage Financial Management Planning Assistance

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4. Overall Sewerage Work in Hoi An City

Sewerage Work in Hoi An City

AFD Project Area Remaining Work

- House Connection
- Construction of STP
- Installation of M& Equipment

Sewer Construction
Construction of Pumping Station

JICA Project Area Remaining Work

- Wastewater Collection system at downstream of STP
- Cleaning of the existing drain, sewer construction and house connection in new residential estate

Rehabilitation of the Japanese Bridge Canal
Construction of STP

The other Area Remaining Work

- Preparation of Development Plan
- Preparation of Fund
- Implementation of Development work

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5. Status of AFD Project

- 1) Construction of sewers and pumping stations have been constructed, and following works remain.
 - Construction of Sewage Treatment Plant (STP)
 - Installation of Mechanical and Electric Equipment for pumping stations
 - Some part of force main
 - House connection
- 2) Operation and Maintenance arrangement is required.
- 3) Relatively large amount of wastewater generated in the AFD service area have to be treated in new STP funded by JICA by completion of house connections and operation of STP of AFD Project.

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II. Project Components

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6. Rehabilitation of the Japanese Bridge Canal

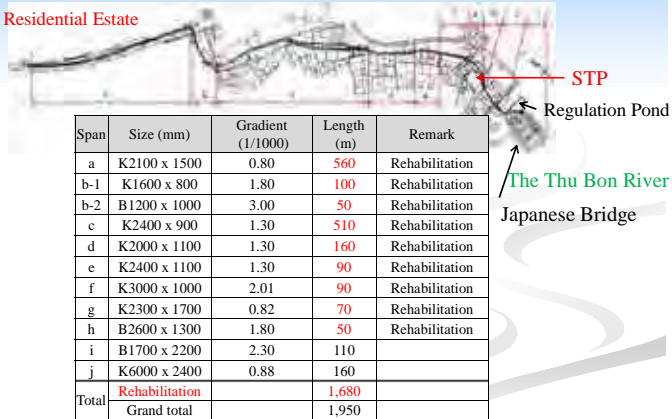
Issues of the Japanese Bridge Canal

- Wastewater flow from new residential estate is quite little at the moment because of low house connection ratio and infiltration from earth drain etc., while discharge from hotels in AFD project area is relatively large amount.
- Relatively clean irrigation water flows in the canal during irrigation period. And the vicinity agricultural areas play important role of regulating function to mitigate flooding condition.
- Invert slope of the canal is irregular and sections having reverse slope and depressions exist. Stagnation of flow and odor are generated during dry season consequently.
- Untreated wastewater from AFD project area flows in the canal at downstream of the STP.
- Dredging and cleaning are required for the existing regulation pond and the section of about 100m close to Japanese Bridge where the section was constructed as scenery open canal with masonry wall.

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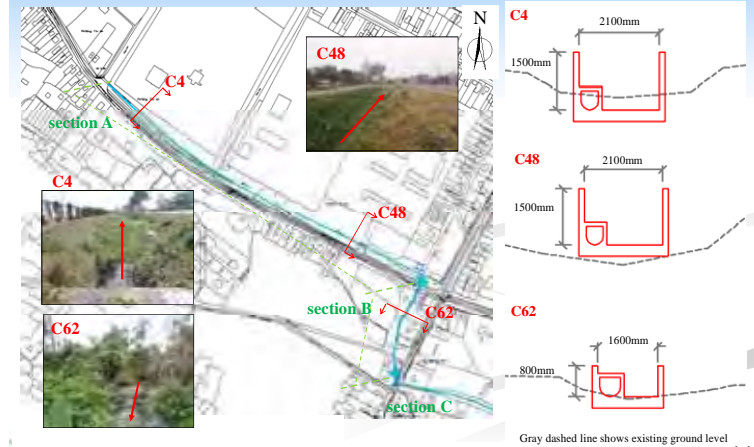
6. Rehabilitation of the Japanese Bridge Canal

New Residential Estate



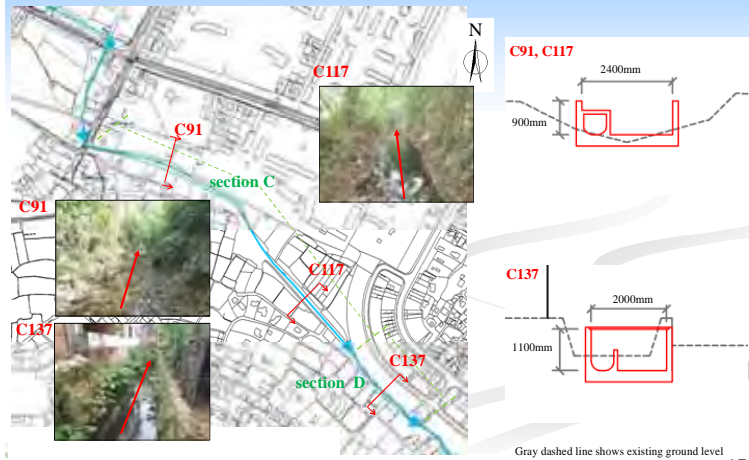
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6. Rehabilitation of the Japanese Bridge Canal



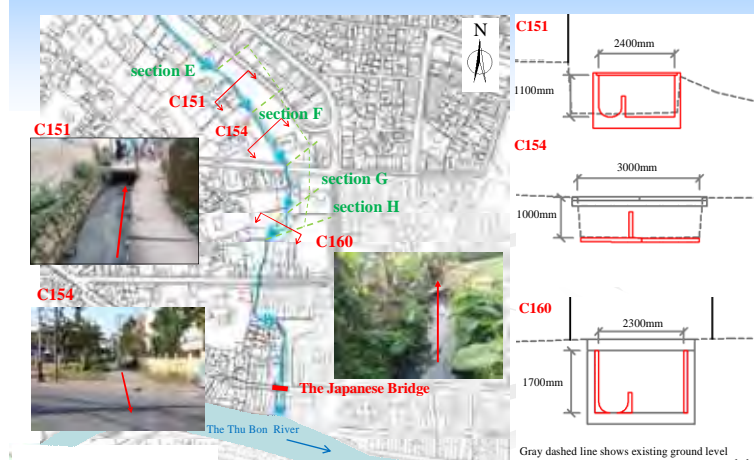
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6. Rehabilitation of the Japanese Bridge Canal



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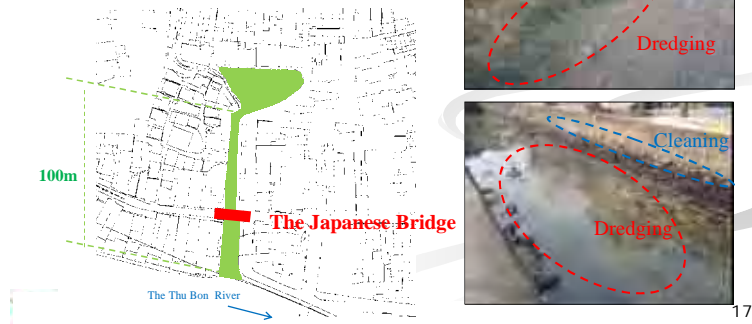
6. Rehabilitation of the Japanese Bridge Canal



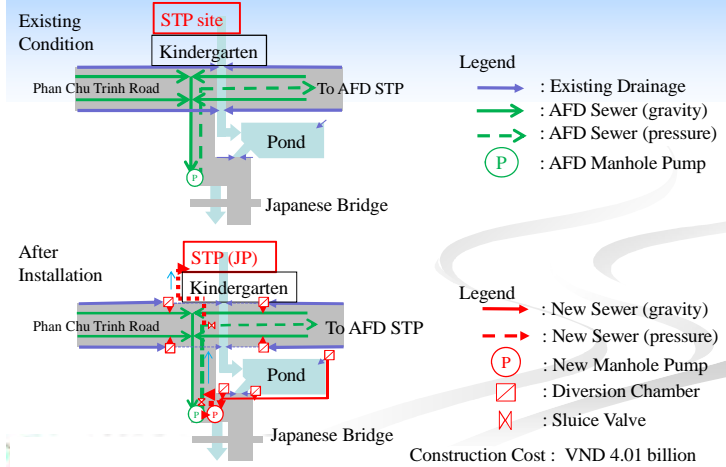
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6. Rehabilitation of the Japanese Bridge Canal (Dredging and Cleaning)

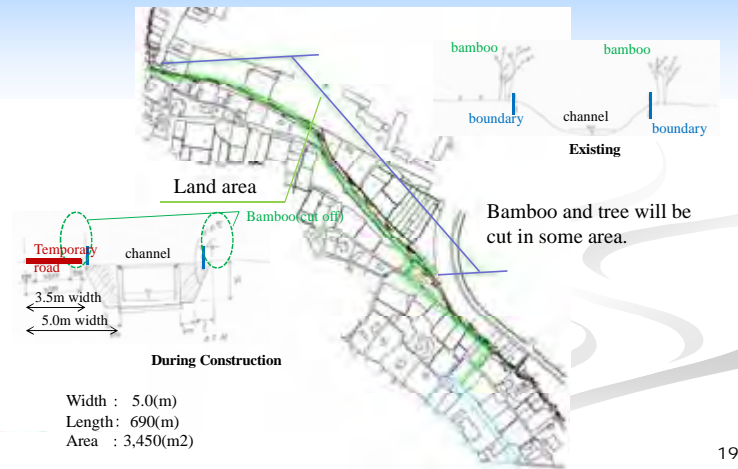
- For Keeping the scenery attractive
- Dredging and Cleaning by manpower and construction Machine



6. Rehabilitation of the Japanese Bridge Canal Installation of collection facilities for Downstream Area of STP



6. Rehabilitation of the Japanese Bridge Canal Temporary Approach Road for Canal rehabilitation

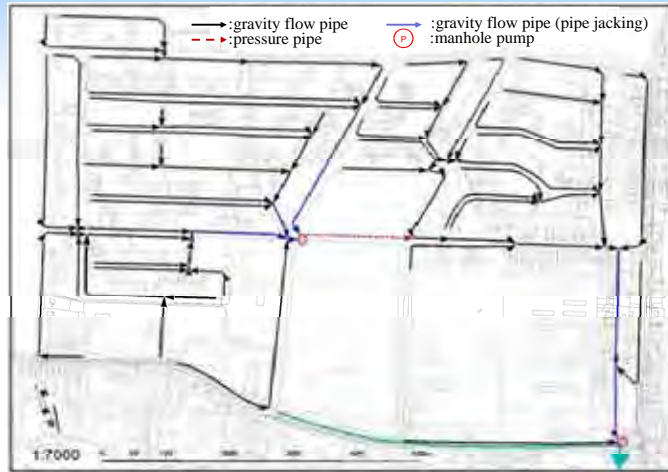


6. Rehabilitation of the Japanese Bridge Canal

New Residential Estate

- Cleaning of the existing drains to make smooth flow from individual houses to the Japanese Bridge Canal in dry and wet whether conditions
- Construction of house connections to accommodate wastewater to the existing drains, or
- Construction of separate sewer to ensure wastewater treatment in the future and to comply national orientation

6. Rehabilitation of the Japanese Bridge Canal



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6. Rehabilitation of the Japanese Bridge Canal

Noted Points

- Parts of canal will be covered, but some parts will remain as open canal
 - Odor generation will be prevented, as sections for wastewater are covered.
 - To keep some open parts as it is to prevent from changing flood locations, since storm water comes in and out at many places in wet weather
 - To collect wastewater separately from irrigation water, which flows into the canal occasionally in dry weather
- Periodical inspection and cleaning of the canal, and canal clean campaigns are inevitable.

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7. Construction of Sewage Treatment Plant (STP)

1) Design Horizon : Year 2020

2) Connection ratio and Served Population of STP

Area	Item	2015	2020	2025	2030
New Residential Area	Connection Ratio (%)	10	75	80	90
	Served Population (Person)	573	4,870	5,635	6,929
AFD Area	Connection Ratio (%)	100	85	60	20
	Served Population (Person)	7,854	6,855	4,938	1,689
Total Served population		8,427	11,726	10,573	8,619

3) Unit Wastewater Flow

130ℓ/cap./day (daily average flow for the are not served by piped water system)

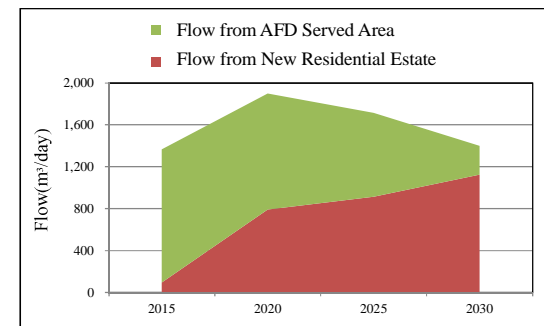
162ℓ/cap./day (daily maximum flow including administrative and commercial flow)

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7. Construction of Sewage Treatment Plant (STP)

3) Wastewater to be Treated (m³/day: daily Maximum)

Area	2,015	2,020	2,025	2,030
New Residential Area	93	790	914	1,124
AFD Area	1,274	1,112	801	274
Total	1,367	1,902	1,715	1,398

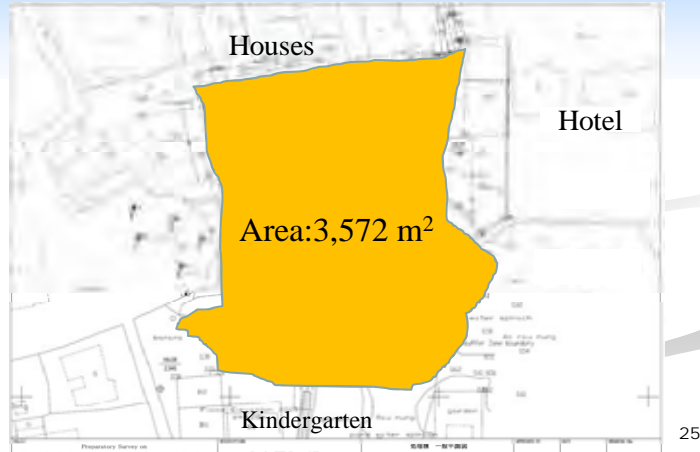


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7. Construction of Sewage Treatment Plant (STP)

3) Design Condition

➤ STP Site



7. Construction of Sewage Treatment Plant (STP)

3) Design Condition

➤ Inflow Water Quality

BOD 220 mg/L, SS= 110mg/L

➤ Required Treated Water Quality

Item	BOD	SS
QCVN 14-2008/BTNM ¹⁾	Less than 50 mg/L	Less than 100mg/L
TCVN 7222:2002 ²⁾	Less than 10 to 30mg/L	Less than 10 to 30mg/L
Designed Treated Water Quality	Less than 10 to 30mg/L	Less than 10 to 30mg/L

Note;

- 1) Water Quality Standards for Domestic Wastewater Discharge, MONRE
- 2) Treated Water Quality Standards of STP, MOC

7. Construction of Sewage Treatment Plant (STP)

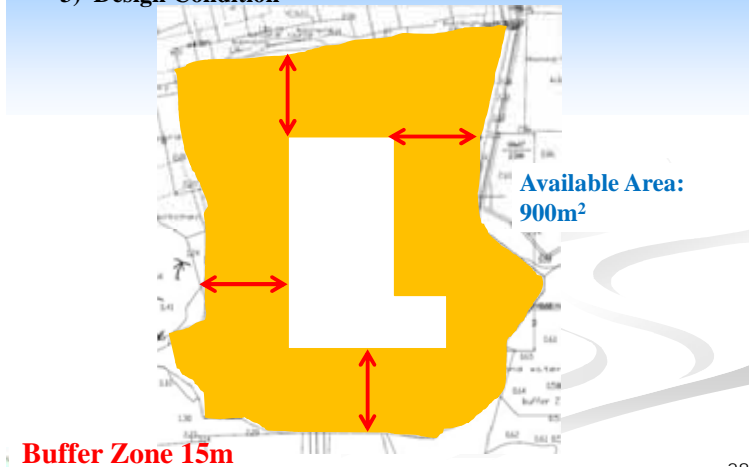
3) Design Condition

➤ Buffer Zone of STP (QCVN07:2010/BXD)

No.	Items	Buffer zone (m) based on capacity (× 1000m ³ /day)			
		< 0.2	0.2 - 5	5 - 50	> 50
1.	Pumping Station	15	20	25	30
2.	Wastewater treatment plant				
a.	Physical treatment (combine with Sludge drying bed)	100	200	300	400
b.	Biological treatment (with Sludge drying bed)	100	150	300	400
c.	Biological treatment without Sludge drying bed (but with Sludge treated equipment)	10	15	30	40
d.	Underground sewage filter yard	100	150	300	500
e.	Sewage farming	50	200	400	1,000
f.	Biological pond	50	200		
g.	Sewage Oxidation channel	50	150		

7. Construction of Sewage Treatment Plant (STP)

3) Design Condition



Buffer Zone 15m

7. Construction of Sewage Treatment Plant (STP)

3) Design Condition

Heritage Preservation are: Zone II-A
(No.2337/2006/QD-UBND)



7. Construction of Sewage Treatment Plant (STP)

3) Design Condition

- Requirement of Zone II-A
- Height of building: 10.5m
- Design of building: roof, color of wall, materials of building, etc.



7. Construction of Sewage Treatment Plant (STP)

3) Design Condition

- Natural and Social Requirements
- Flood level : 4.28m in 2009

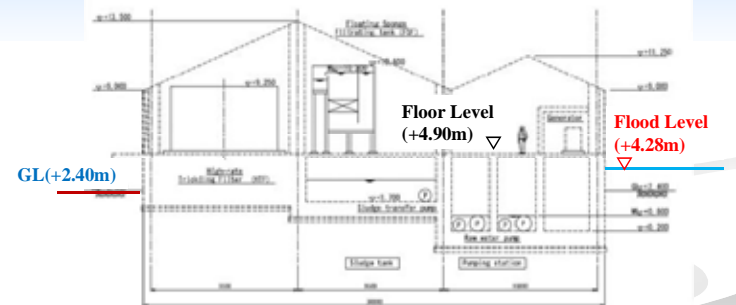


- Social Requirement
- Reduce impact of odor on neighbors

7. Construction of Sewage Treatment Plant (STP)

3) Design Condition

- Structural Arrangement



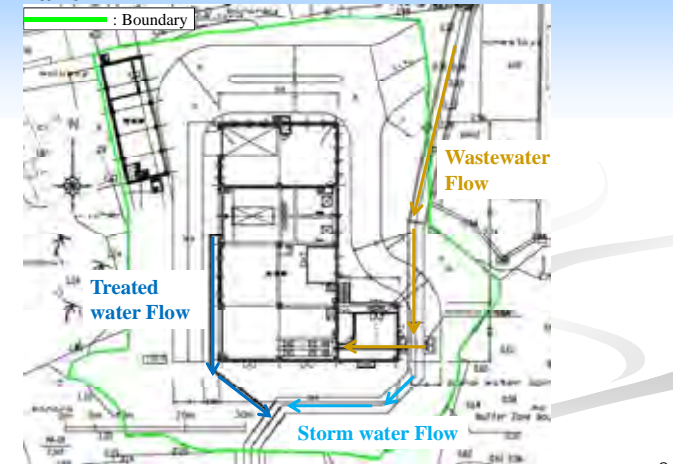
- Floor Level: 4.9m is higher than Flood Level of 4.28m.
- Deodorization system is installed and odor is treated.

7. Construction of Sewage Treatment Plant (STP)

- Capacity : 2,000 m³/day (Daily Maximum)
- Process : Pre-treated Trickling Filtration (PTF)
(the First International Technology Certificate by Japan Sewage Works Agency)
- Building for Treatment Facilities: Building to cover treatment facilities is required by Hoi An Centre for Monuments Management and Preservation (HCMMP) to keep scenery of World's Cultural Heritage Preservation
- Administration Building : Floor area of 284 m² with electrical room, administration office, and water quality analysis room on the second floor

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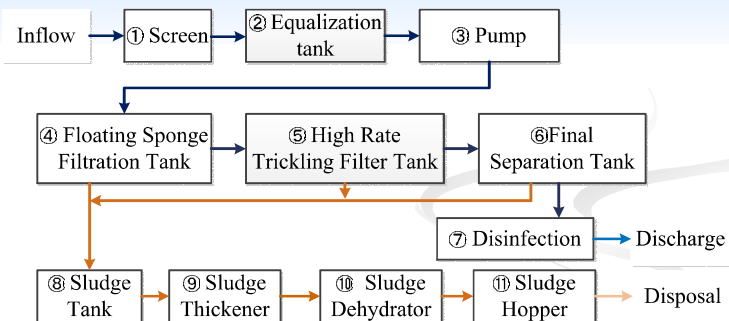
7. Construction of Sewage Treatment Plant (STP) Plane



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7. Construction of Sewage Treatment Plant (STP)

Treatment Flow



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	Treatment Unit	Function
①	Screen	To remove small materials such as wood, fiber, and food waste for the protection of pump and floating sponge filtration unit.
②	Equalization Tank	To store wastewater which is over than 2,000m ³ /d(83.3 m ³ /h) flow when wastewater increases due to rain and so on
③	Pump	To lift wastewater to Floating Sponge Filtration
④	Floating Sponge Filtration Tank	To remove SS such as debris in wastewater
⑤	High Rate Trickling Filter Tank	To remove BOD in wastewater
⑥	Final Separation Tank	To remove SS derived from the biofilm of trickling filter.
⑦	Disinfection	To inactivate pathogen in treated water.
⑧	Sludge Tank	To store sludge from Floating Sponge Filtration and Final Separation Tank.
⑨	Sludge Thickener	To increase the solids content of sludge by removing a portion of the liquid fractions.
⑩	Sludge Dehydrator	To dewater the sludge from sludge thickening Tank.
⑪	Sludge Hopper	To store dewatered sludge

Structure of Treatment Unit

- Equalization tank, final separation tank, disinfection tank, sludge tank are made by reinforced concrete because of underground structure.
- Floating sponge filtration tank, high rate trickling filter tank, and sludge thickener are made by steel with anti corrosion coating.

	Reinforced Concrete	Steel
Quality of anti-corrosion coating	Quality control is difficult due to on-site anti-corrosion coating in small working space.	Quality is relatively good because coating is conducted in the factory.
Construction quality	High watertightness is required because backwash is required. High construction management is required for pipe embedding and assemble of parts in a small inside tank space.	Main parts are checked in the factory before assembled at on-site. If necessary, water tightness is checked in the factory. Because the product quality is checked in the factory, high construction quality is secured.
Replacement	Under height restriction due to heritage area, it is difficult to replace parts and equipment from reinforced concrete tank without damage.	Whole units including tanks and parts are replaced. It is easy to replace units.
Evaluation	On-site construction in a small space is difficult to manage the construction quality.	High treatment quality is expected because main parts are checked in the factory. Also, replacement is easy. Steel is recommended.

7. Construction of Sewage Treatment Plant (STP)

Tentative Perspective Drawing



7. Construction of Sewage Treatment Plant (STP)

Required Land Lease for STP Construction



Approach road: 700 m²

Affected Household : Not expected

Compensation is necessary as a lease fee

7. Construction of Sewage Treatment Plant (STP)

Noted Points

- **Flooding** : Structural arrangement is made for flood free of treatment facilities, and all the gates and shutters shall be closed during flood to prevent first floor from inundating.
Cleaning works are required after flooding.
- **O&M** : Periodical inspection, cleaning, and refilling of chemicals etc. are required.
Deodorization facilities shall be operated continuously.
- **Measurement**: Devices and P/C are installed for measurement and record of odor, visibility, and pH in water quality analysis room.
- **Assistance** : O&M status will be monitored and proper O&M activities are advised by experts for six months after STP commissioning

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7. Construction of Sewage Treatment Plant (STP)

Noted Points

- **Required Activities** before commencement of STP construction
 - Approval of detailed design and implementation of the construction works
 - Approval of Heritage Preservation Committee for the construction
 - Agreement of land lease for access road for STP and canal rehabilitation works
 - Reservation of stock yard and excess soil dumping site
 - Explanation of construction works to the affected residents
 - Safety management of the construction
 - Environmental monitoring
 - Installation of utilities to STP

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8. Equipment Supply

- Four (4) ton canopy truck is procured and equipped at STP to transfer generated dewatered sludge to Khanh Son disposal site in Da Nang.
- Inspection equipment for water quality control, P/C, and printer for data logging are equipped as part of devises of administration building and are not designated as supply equipment in the procurement plan.
- **Note** : The canopy truck will carry out dewatered sludge once a week.
To prevent from possible odor diffusion during carrying out of the sludge, frequent cleaning and deodorization before the carrying out are inevitable.

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9. Consulting Services (Soft Components included)

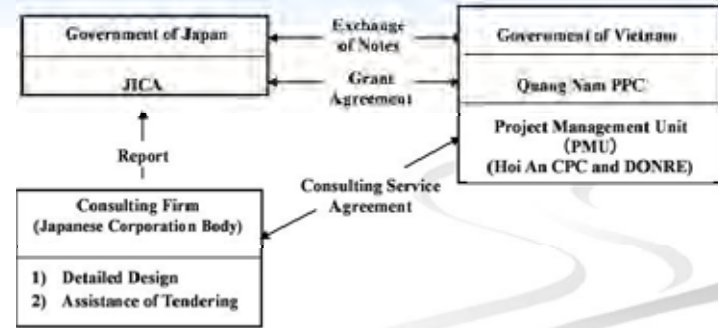
- Detailed design, tender assistance, and construction supervision are designated in the project, and executive agency will have a contract for the consulting services.
- Following soft components are included in the consulting services.
 - Operation and Maintenance Guidance of STP
 - Maintenance Guidance of the Japanese Bridge Canal
 - Sewerage Financial Management Planning Assistance.

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III. Implementation Structure

10. Implementation Structure, Operation and Maintenance

1) E/N, G/A, DD, Tendering Stage



10. Implementation Structure, Operation and Maintenance

2) Construction of Facilities and Procurement of Equipment Stage



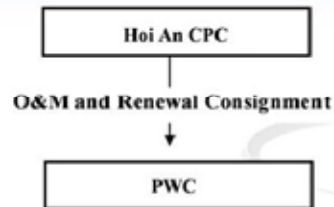
10. Implementation Structure, Operation and Maintenance

3) Trial Operation Stage



10. Implementation Structure, Operation and Maintenance

4) O&M and Renewal Stage



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10. Implementation Structure, Operation and Maintenance

Issues to be tackled

- No experience of operation and Maintenance (O&M) of STP
- Skilled staff are required for O&M of STP
- There are lots of cases in which facilities constructed by ODA assistance are almost abandoned due to lack of proper maintenance and replacement.
- AFD project has not been completed yet.

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10. Implementation Structure, Operation and Maintenance

- PMU will be established immediately after signing of Exchange of Note (E/N) in March, 2015
- Operation and maintenance (O&M) works will be contracted out to PWC.

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10. Implementation Structure, Operation and Maintenance

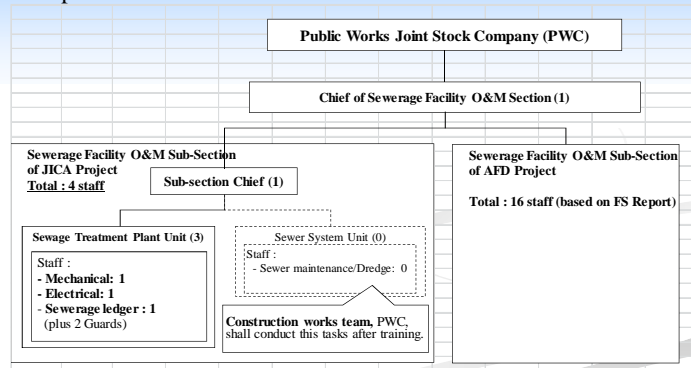
Confirmation required

- Time of establishment, member, Terms of Reference (TOR) of PMU, and liaison way with Quang Nam Province will be confirmed.
- Procedure of sub-contract of O&M works to PWC will be confirmed.
- Number (4 engineers) and time (3 months before completion of construction) of new employment of O&M staff by PWC will be confirmed,

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10. Implementation Structure, Operation and Maintenance

- Expected O&M structure in PWC.



Note: *: Mechanical staff and Electrical staff shall be responsible for operation and maintenance of facilities.

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11. Soft Components (Technical Assistance) Plan

- O&M Guidance of STP
 - Support on; O&M organization plan, staffing, Job demarcation of sewerage sector, Job description preparation & explanation, etc.
- Maintenance Guidance of Japanese Bridge Canal
 - Guidance on; inspection and maintenance rotation plan in the City, staff recruitment or temporary employment/outsourcing plan, manual preparation with record format.
- Sewerage Financial Management Planning Assistance
 - Guidance on; the importance of budgetary arrangements for sewerage O&M/replacement costs, to prepare daily accounting documents for a sewerage, and annual income expenditure format.

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11. Soft Components (Technical Assistance) Plan

Items to be clarified

- Which dept. of Hoi An CPC or PWC shall responsible for the following tasks ?
 - Policy formation
 - Budget acquisition
 - Planning of replacement of equipment
 - Public relation / public education
 - Daily operation (PWC, and any other?)
 - Signer of outsourcing O&M of STP

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11. Soft Components (Technical Assistance) Plan

Items to be clarified

- Counterpart organizations for each Soft Component Activity
 - O&M of STP (O&M Section, PWC & Hoi An CPC, any other?)
 - Maintenance of the Japanese Bridge Canal (Construction Works Team & Technical and Planning Department, PWC, any other?)
 - Sewerage Financial Management (Financial Department or sewerage O&M Section, PWC and DOFP, Hoi AN CPC, any other?)

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12. Environmental and Social Considerations

Activities to be conducted by Vietnamese Side in accordance with JICA Guideline and Vietnamese Laws

1) Preparation Stage before construction

- Lease and compensation for temporary access and stock yard for construction of STP and rehabilitation of the Japanese Bridge Canal, including consensus building
- Support for the bicycle shop illegally occupying and doing business on the Japanese Bridge Canal, including storage of the asset during construction works, minimization of area and period for temporary loss, and consensus building
- Explanation of construction works to the affected residents

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12. Environmental and Social Considerations

2) Construction Stage

- Implementation of environmental monitoring in accordance with the Monitoring Plan for the Project described in the Draft Final Report.
- Submission of monitoring results to JICA in Quarterly Project Progress Report by filling in the Monitoring Form indicated in the Draft Final Report

3) Operation Stage

- Continuous implementation of environmental monitoring in accordance with the Monitoring Plan until target year and submission of monitoring results to JICA on semi-annual basis by filling in the Monitoring Form

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IV. Project Cost and Schedule

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13. Project Cost Estimate

Project Cost : JPY1,139 million

Japan's Grant Aid: JPY 1,091 million,

Vietnam Side :JPY 48 million (VND 9.8 billion)

(Cost: million JPY)

Item	Total	Grant Aid	Remarks
Construction	993.2	945.2	Note 1)
Equipment Supply	7.5	7.5	One canopy truck
Detailed Design, Tender Assistance, Supervision	122.1	122.1	March 2015 – June, 2017
Soft Components	16.2	16.2	January 2017 – June, 2018
Total	1,139.0	1,091.0	

Note1): Undertaking by Vietnam side : Utility to STP site, a part of collection sewer, and land lease for temporary access

Note : VND 1 = JPY 0.0048855, US\$ 1 =JPY 103.22

To be revised in detailed design stage

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13. Project Cost Estimate

O&M Cost :

(Cost: million VND/Month)

Cost Items	Amount
Personnel cost	28.0
Electricity cost	27.4
Repair cost	75.6
Water quality analysis cost	4.0
Sludge treatment and disposal cost	19.1
Replacement cost	0.0
Other cost	1.5
Total	155.6

Annual O/M Cost : VND 1,867.2 million /year
 Replacement costs in every 20 year : VND 67,728 million

Note : VND 1 = JPY 0.0048855
 Note : To be revised in detailed design stage

14. Implementation Schedule

Item	Expected Date
Cabinet Meeting in JAPAN	February in 2015
E/N and G/A	March in 2015
Consulting service Agreement	March in 2015
DD Procurment	April in 2015
Pre-qualification (P/Q) Notice	August in 2015
Tendering	September in 2015
Contract Signing	November in 2015
Verification of Contract	November in 2015
PMU Establishment	March in 2015
Construction of STP	February in 2016
M&E installation	August in 2016
O&M Unit Establishment	December in 2015
Trial Operation of STP	January in 2017
Soft Component	July in 2017

15. Implementation Schedule

Year	2015												2016											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Month																								
E/N &G/A			▲																					
Detailed Design				↔	↔																			
Contractor Agreement							↔	↔	↔															
Construction													↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔
Trial Operation																								
Completion of Construction																								
Soft Component																								
End of Defects Liability																								

15. Implementation Schedule

Year	2017												2018											
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
Month																								
E/N &G/A																								
Detailed Design																								
Contractor Agreement																								
Construction	↔	↔	↔	↔	↔	↔																		
Trial Operation							↔	↔	↔	↔														
Completion of Construction																								
Soft Component																								
End of Defects Liability	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	↔	▲

V. Obligation of Recipient Country

15. Undertakings of the Vietnamese Side

➤ **Items conducted**

- 1) Completion of land acquisition for STP site on April 23, 2014 based on Decision No.781/QD-UBND of Hoi An CPC dated April 10, 2014
- 2) Approval of EIA by Decision No.1643/QD-UBND of Quang Nam PPC dated May 29, 2014, including stakeholder meeting and agreement of relevant residents
- 3) Approval of investment for the project (F/S approval) by Decision No: 2558/QD-UBND of Quang Nam PPC dated August 10, 2014

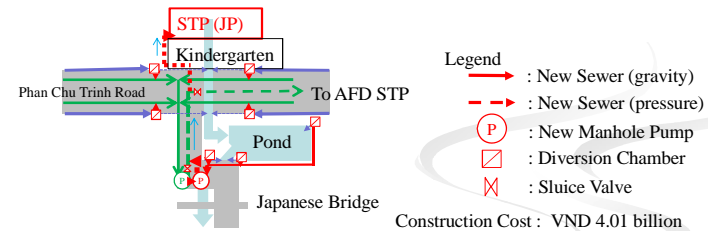
15. Undertakings of the Vietnamese Side

➤ **Construction Works by Vietnamese Side**

	Items	Conditions
1	Power and Water Supply Lines to STP Site	The installation of power lines, water supply, a telephone line, and drainage from outside the site will be carried out.
2	Installation of Fence and Gate around STP Site	After construction of STP, the installation of a fence and gate surrounding the STP site will be carried out .
3	Construction for Collection System of Wastewater at Downstream of STP	The construction for collection system of wastewater from the downstream area of STP will be conducted according to Letter No.824/UBND dated April 4th, 2014 issued by Hoi An CPC.

14. Undertakings of the Vietnamese Side

➤ **Construction Works by Vietnamese Side**



15. Undertakings of the Vietnamese Side

➤ Items required from E/N signing to tendering for construction (1/2)

No	Item	Timing
1	Establishment of PMU	Immediately after E/N signing (March, 2015)
2	Banking Arrangement	
3	Procurement of DD Consultants	
4	Arrangement of tax exemption for all activities	Immediately after Procurement of DD Consultants (March, 2015)
5	Agreement of land lease for access road for STP and canal rehabilitation works	
6	Reservation of stock yard and excess soil dumping site	
7	Approval of Heritage Preservation Committee for the construction	

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15. Undertakings of the Vietnamese Side

➤ Items required from E/N signing to tendering for construction (2/2)

No	Item	Timing
8	Information to UNESCO	Immediately after Procurement of DD Consultants (March, 2015)
9	Explanation of construction works to the affected residents	Before Tendering of contractor (June, 2015)
10	Approval of detailed design and implementation of the construction works	

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15. Undertakings of the Vietnamese Side

➤ Items required during the construction (1/2)

No	Item	Timing
1	Approval of commencement of the construction	Immediately after contract signing with contractor (November, 2015)
2	Periodical explanation of the construction works to the affected residents	During Construction (December, 2015 - June, 2017)
3	Safety management of the construction	
4	Environmental monitoring	
5	Employment of O&M staff and their training	Immediately after contract signing with contractor (November, 2015)
6	Assignment of counterpart personnel for soft components	

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15. Undertakings of the Vietnamese Side

➤ Items required during the construction (2/2)

No	Item	Timing
7	Construction works for collection system at downstream of STP	Immediately after contract signing with contractor (November, 2015)
8	Assurance of sludge disposal site	

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15. Undertakings of the Vietnamese Side

➤ Items required during operation of STP

No	Item	Timing
1	Execution of environmental monitoring and environmental management plan	During Operation of STP
2	Execution of soft component	For 1 year after Commissioning of STP
3	O&M of the facilities including budgetary arrangement	During Operation of STP
4	Contentious training of O&M staff	

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Thank you for your attention.

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